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NATIONAL BUREAU OF STANDARDS
Lyman J. Briggs
Director

NATIONAL BUREAU OF STANDARDS
HYDRAULIC LABORATORY BULLETIN
SERIES A

CURRENT HYDRAULIC LABORATORY RESEARCH IN THE UNITED STATES

BULLETIN VI
January 1, 1938.

WASHINGTON

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CURRENT HYDRAULIC LABORATORY RESEARCH IN THE UNITED STATES

Compiled by the National Bureau of Standards,
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Edited by Chilton A. Wright,
Hydraulic Laboratory Section,
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INTRODUCTION

The following list shows which issues of National Bureau of Standards Hydraulic Laboratory Bulletins, Series A and Series B, are still available.

Series A. Current Hydraulic Laboratory Research in the United States.

Bulletin IV-1, January 1, 1936.
" IV-2, July 1, 1936.
" V-1, January 1, 1937.
" V-2, July 1, 1937.

Series B. Hydraulic Laboratories in the United States, (1933).
" " " " " " (1935).

The fact that the work involved in issuing this bulletin has become very considerable, and that approximately 75 per cent of the projects reported are repeated from previous issues made it seem desirable to secure opinions from the individuals making use of this information as to whether a bulletin published annually would not be practically as useful as one published semiannually. Consequently a questionnaire was sent out in October to a number of individuals and organizations that have a particular interest in hydraulic research. Eighty-five replies were received and are summarized below.

(1) 39 considered the bulletin to be of great value.
42 " " " " " " moderate value.
4 " " " " " " little value.

(2) 5 considered semiannual publication desirable.
79 " annual " sufficient.

(3) 56 considered the lists of translations valuable.
47 " " " " foreign pamphlets "
40 " " committee statements "

In reply to a question as to when reports for the bulletin could be submitted to best advantage, there was no general agreement. One large group preferred to submit reports from May to July. A somewhat smaller group preferred to submit their reports from September to November, and a few indicated a preference for January.

After a careful consideration of the replies, it was decided to issue the bulletin annually in the future, to accept reports up to November 1, and to issue the bulletin on January 1. The decision to issue the bulletin at this particular time was made because, although the largest group of those replying preferred to have the bulletin issued during the summer, this is the most difficult time of the year for the National Bureau of Standards to prepare and mimeograph the bulletin.

A number of suggestions were made in regard to the contents of the reports submitted. Several individuals criticised the "obvious padding of reports and over-enthusiastic previews of research never completed" on the part of a few laboratories. A somewhat similar criticism refers to the "statement of conclusions that .... may be outright misleading, or else be proven false by subsequent experimentation ... " This Bureau appreciates both of these criticisms, but has consistently taken the position that it cannot attempt to censor the material submitted.

Another suggestion is to the effect that the bulletin should list research projects that may involve field studies, as well as those that are carried out in the laboratory. The desirability of reporting in this bulletin field investigations and hydrologic researches was recognized in the introduction to the first bulletin of this series, and it was stated there that, with some exceptions, such projects might legitimately be reported. The criterion would seem to be whether the primary purpose of the investigation is to study the flow of a fluid or not.

It seems desirable to emphasize again that the main purpose of this bulletin is to furnish information as to what research of the nature referred to above is in progress, not to serve as a medium for the publication of results. Abstracts containing not more than 250 words and giving the results of completed investigations have been solicited in the past and will be included in the bulletins in the future when furnished. Abstracts of this length are adequate to indicate to any interested person whether the results of the investigation are of sufficient interest to warrant his writing to the experimenter for further details, but to remove such a restriction on length would certainly lead to an extension of the scope of the bulletin beyond that is considered permissible, and would make it unduly large.

In the interests of reducing unnecessary repetition, the following procedure will be followed in this and future issues of the bulletin:

If no report is received from a contributing laboratory in time for any issue, the laboratory will be listed and its projects as last reported will be given by number and title only, with a statement that no report was received.

Only new projects will be reported completely. Continuing projects will carry under items (b), (d), (f) and (g) a reference to the earlier issue in which the complete information is given. An ample supply of the more recent issues will be available to fill requests for these numbers for some time after they appear.

The following form will be used in reporting new projects -

(a) Title of project:
(b) Project conducted for:
(c) Nature of project:
(d) Investigators:
(e) Correspondent:
(f) Purpose:
(g) Method and scope:
(h) Progress:
(i) Remarks:

The following form will be used in reporting continuing projects.

(a) Title of project:
(c) Nature of project:
(e) Correspondent:
(h) Progress:
(i) Remarks:

(b), (d), (f) and (g) See complete report of this project in Bulletin _____, page _____.

CURRENT PROJECTS IN HYDRAULIC LABORATORIES.

BALDWIN-SOUTHWARK CORPORATION. (No report received.)

(578) Efficiency and horsepower tests - model hydraulic turbine with various draft tube designs.

(579) Efficiency and horsepower tests - model propeller type hydraulic turbine.

.....

CALIFORNIA INSTITUTE OF TECHNOLOGY,
Cooperative Laboratory, Soil Conservation Service. (No report received.)

(657) Investigation of reliability of sand and gravel sample splitters and suggested improvements in design.

(658) The use of probability graphs in the interpretation of mechanical analyses of sediments.

(659) Mechanics of suspended load transportation.

(660) Development of a hot-wire velocity meter for use in water.

(661) The development of a grab sampler for suspended load.

(662) The development of a method for measuring rate of flow in steep channels carrying suspended load.

(663) Mechanics of sediment suspension.

(664) Nomogram for the settling velocity of spheres.
(Editor's note - See paper by Hunter Rouse, published as Exhibit D, of the Report of the Committee on Sedimentation, Division of Geology and Geography, National Research Council, 1936-1937, pp. 57-64.)

.....

CALIFORNIA INSTITUTE OF TECHNOLOGY,
Hydraulic Machinery Laboratory. (No report received.)

(102) Investigation of velocity distribution in the volute of a centrifugal pump in the neighborhood of the impeller.

(356) Study of the characteristics of high head centrifugal pumps.

(545) The variation of resistance to flow with the amount of opening, on valves of both the follower ring gate and circular passage plug types.

(546) Investigation of the effect of variations in initial velocity distribution upon the coefficients of a series of venturi tubes.

CALIFORNIA INSTITUTE OF TECHNOLOGY,
Hydraulic Structures Laboratory. (No report received.)

(357) Investigation of high-velocity flow around bends in open channels.

(358) A study of surge wave propagation and travel in channels of steep gradient.

(359) A study of the speed of propagation of flood hydrographs in channels of various gradients.

(656) Investigation of high-velocity flow around bends in open channels.

UNIVERSITY OF CALIFORNIA.

(c) Correspondent Professor M. P. O'Brien for all projects listed.(1)

(280) (a) ORIFICES AND NOZZLES FOR MEASURING DISCHARGE AT END OF PIPE LINE.
(c) Laboratory project in cooperation with Fluid Meters Committee of A.S.M.E.
(h) Summary of first tests submitted to A.S.M.E. Second series of tests in progress.
(d) and (f) See Bulletin V-2, page 9.

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(423) (a) FLOOD WAVES.

(c) Graduate thesis.
(d) L. B. Wilby (Lieut.)
(i) A continuation of project reported in Bulletin V-2, page 10.

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(424) (a) INTERSECTING STREAMS.
(c) Graduate and undergraduate thesis.
(d) I.C.Rumsey (Lieut.), R. Bickerstaff and R.L.Stoker.
(h) Study of diverging streams in progress.
(i) Continuation of work reported in Bulletin V-2, page 10.

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(1) Professor O'Brien has suggested that any material which may be loaned in response to requests received should be returned promptly, for in many cases only one copy of a report is available for loan.

(426) (a) HYDRAULIC ROUGHNESS IN CLOSED CHANNELS.
(c) Laboratory Project.
(i) Continuation of work reported in Bulletin V-1, page 33.

(427) (a) FLOW OF WATER IN TIDAL CANALS.
(c) Graduate thesis.
(d) R.G.MacDonnell (Lieut.)
(i) Continuation of project reported in Bulletin IV-2, page 5.

(631) (a) HOT-WIRE ANEMOMETER.
(c) Laboratory project.
(i) See Bulletin V-2, page 10.

(634) (a) SAN DIMAS METERING FLUME.
(c) Laboratory project in cooperation with California Forest and Range Experimental Station.
(h) The effect of roughness and bed slope on the calibration is being studied at present.
(i) See Bulletin V-2, Page 11.

(719) (a) HYDRAULIC ROUGHNESS IN OPEN CHANNELS.
(b) Laboratory Project.
(c) Graduate Thesis.
(d) T. deF. Rogers (Lieut.)
(f) To study effect of artificially roughened surfaces in open channels.
(g) Channel of triangular cross-section will be used.
(h) Experimental work started.

(720) (a) MODEL STUDY OF WAVE ACTION ON CABRILLO BEACH, CALIFORNIA.
(b) Cooperation with Los Angeles Playground and Recreation Department.
(c) Graduate thesis.
(d) H.C.Gee (Lieut.)
(h) Model under construction.

(721) (a) MODEL STUDY OF BEACH EROSION AT SANTA BARBARA, CALIFORNIA.
(b) Laboratory project.
(c) Graduate thesis.
(d) W.C.Hall (Lieut.)
(f) To study distorted models of beach protection structures.
(h) Models under construction.

(722) (a) SURGING IN HARBORS.
(b) Laboratory project.
(c) Graduate thesis.
(d) C. R. Broushous (Lieut.)
(f) To investigate experimentally existing theories of surges.
(g) The height and frequencies of the surges as well as the position of the nodes are being measured in basins of both uniform and variable depth. The surges are produced by a reciprocating plunger driven at various constant frequencies.
(h) Experimental work in progress.

.....

(723) (a) RECOVERY EFFICIENCY OF VARIOUS TYPES OF SLOWLY MOVING FLUID INTERFACES.
(b) Standard Oil Co. of California Research Fellowship.
(c) Laboratory project.
(d) D. R. Rankin.
(f) To determine the most efficient type of repressuring media for oil recovery.
(g) Measure recovery of oil from a cylinder of oil-saturated sand for water and gas drives.
(h) Equipment being assembled.

.....

(724) (a) EFFECT OF PULSATING FLOW ON ORIFICE AND NOZZLE COEFFICIENTS.
(c) Laboratory project.
(d) R. L. O'Bryan.
(f) To determine the error involved in metering pulsating flow.
(g) Pulsations are produced by a rotating valve in pipe line.
(h) Tests in progress.

.....

(725) (a) MODIFIED VENTURI SECTION FOR OPEN CHANNELS.
(b) Laboratory project in cooperation with Agricultural Experiment Station at Davis.
(d) W. Wallace, J.E.Christiansen and R.G.Folsom.
(f) To determine the advantages of a venturi section under conditions of flat gradient and low canal velocities.
(g) Venturi section, contracted from the top, is placed in a rectangular channel.
(h) First model section analysis completed.

.....

(726) (a) PUMP TESTING LABORATORY.
(b) Laboratory investigations in cooperation with the College of Agriculture.
(d) H.E.Burrier, R.G.Folsom, W. Johnson.
(f) Research in the general field of pumping.

(g) Present investigations include:
1. Research in the field of deep-well and propeller pumps.
2. Analysis of laboratory and field methods of testing, development of test standards and calibration of test instruments.
3. Tests of motors, bearings, and other auxiliary equipment.
4. Tests of manufacturers' types.
5. Tests on specific pumps and pump accessories and equipment.

(h) The equipment is in operation.

.....

UNIVERSITY OF CALIFORNIA,
College of Agriculture, Davis, California. (No report received.)

(270) The effect of depth to water table upon the loss of water from the soil surface. (Part of project on principles of soil moisture in relation to irrigation.)

(271) Movement of moisture through soils. (Part of project on principles of soil moisture in relation to irrigation.)

(272) Characteristics of sprinklers and sprinkler systems for irrigation. (Part of larger project on farm irrigation structures and systems.)

(666) Thermodynamic studies of evaporation from free water, soil and plants.

(667) Hydrology of irrigation water supplies in California.

.....

CARNEGIE INSTITUTE OF TECHNOLOGY.

(490) (a) INVESTIGATION OF TRAVELING WAVES IN STEEP CHANNELS.
(b) Pure research. This is an authorized project of the American Society of Civil Engineers' Special Committee on Hydraulic Research. During the past two years the project was carried on in cooperation with the thesis work of R. F. Shnake and F. A. Morrison, graduate students. It is continued this year as a thesis by J. W. Dougherty, graduate student.
(c) Laboratory investigation and theoretical analysis, together with field investigation of traveling waves in steep channels connected with actual engineering structures.
(d) H. A. Thomas and J. W. Dougherty.
(e) H. A. Thomas.
(h) Work is still in progress.
(f) and (g) See complete report of the project in Bulletin IV-2, page 35.

.....

(669) (a) CONSTRUCTION OF A MODEL OF THE ALLEGHENY, MONONGAHELA, AND UPPER OHIO RIVER SYSTEM FOR USE AS AN INTEGRATING MACHINE FOR SOLVING PROBLEMS OF FLOOD WAVE MOVEMENTS IN THIS RIVER.

(c) Laboratory investigation using a distorted scale model.

(d) H. A. Thomas, E. P. Schuleen, W. J. Hopkins and W. S. Hamilton.

(e) H. A. Thomas.

(h) Preliminary tests on a typical model channel have been completed. The construction of the main model is finished and calibration studies are under way.

(i) The model channels are designed to satisfy the general differential equation for flood-wave movement, velocity-head and acceleration-head effect being included in the representation.

(b), (f) and (g) See complete report of this project in Bulletin V-3, page 17.

.....

(727) (a) MODEL STUDIES TO ELIMINATE CAVITATION AT ENTRANCES OF OUTLET CONDUITS OF MADDEN DAM CHAGRES RIVER, PANAMA CANAL ZONE.

(b) U. S. War Dept. under supervision of Pittsburgh District Office.

(c) Laboratory investigation using two models.

(d) H. A. Thomas, E. P. Schuleen, W. J. Hopkins, J. C. French.

(e) H. A. Thomas.

(f) To study various methods of eliminating cavitation and the resultant pitting immediately downstream from the conduit entrances.

(g) 1. A self-contained model apparatus was constructed in which water could be circulated through various conduit sections at sub-atmospheric pressure to study the effect of discharge constrictors, and various entrance curves on cavitation. Model scales 1 : 20 and 1 : 15.

2. A 1 : 40 scale pyralin model was constructed to study the effect of introducing air at the gates and stop-log slots.

(h) Tests have been completed.

(i) Final reports have been completed and submitted to the Panama Canal Zone and the Pittsburgh District Office.

(Editor's note - This is an extension of former project (489))

.....

(728) (a) INVESTIGATION OF EROSION BELOW DAMS.
(b) Carnegie Institute of Technology.
(c) Graduate thesis.
(d) H. A. Thomas and B. Netzer.
(e) H. A. Thomas.
(f) To obtain systematic and comprehensive information on the effectiveness of various types of spillway aprons or buckets in controlling erosion below dams.
(g) The investigation includes the coordination and classification of a large amount of data secured during model tests on various spillway aprons in this and other laboratories, and the making of additional tests in a glass-sided flume to verify or amplify the existing information. Velocities in the turbulent-flow region below the spillway are measured by a specially designed device which records instantaneous velocity peaks. Final results are to be presented in the form of curves which will enable designing engineers to predetermine the exact hydraulic behavior of a large variety of spillway aprons or buckets with or without baffles, sills, and stilling basins.
(h) Work now in progress.

.....

(729) (a) MODEL STUDIES IN CONNECTION WITH THE PROPOSED TIONESTA CREEK, CROOKED CREEK, AND REDBANK CREEK FLOOD CONTROL DAMS.
(b) U. S. War Department.
(c) Laboratory investigation on a group of models.
(d) H. A. Thomas, E. P. Schuleen, W. J. Hopkins.
(e) H. A. Thomas.
(f) To furnish data and recommendations for design.
(g) Investigation includes the construction and testing of nine models up to the present time, as follows:
A. Tionesta Creek Project.
1. A 1 : 36 scale pyralin model of the intake tower, tunnel, and stilling basin to study flow conditions under various means of operation and to design an adequate stilling basin.
2. A 1 : 80 scale model of the saddle spillway to study flow characteristics in the spillway channel.
3. A 1 : 200 scale model of the saddle spillway, tunnel, and earth dam structure to study the scour conditions below the saddle spillway.
B. Crooked Creek Project.
4. A 1 : 72 scale model of the saddle spillway to study flow characteristics in the spillway channel.
5. A 1 : 180 scale model of the saddle spillway, tunnel, and earth dam structure to study the scour conditions below the saddle spillway.

C. Redbank Creek Project.

6. A 1 : 30 scale model of the spillway, bucket, and apron section to compare the merits of various bucket and apron designs with regard to scour and velocity distribution below the dam.

7. A 1 : 36 scale model of the spillway section and apron, to study proper design of piers, gate operation, pressures on the spillway, and to check performance of apron.

8. A 1 :24 scale model of the conduits and deflectors, to study flow conditions in the conduits and energy dissipation of the jet below the dam.

9. A 1 : 72 scale, general model, to study the general features of design, and gate and conduit operation.

(h) Studies on models (2), (3), (4), (5), and (6) have been completed. Preliminary report has been submitted on (3). Studies on models (1), (7), and (8) are still in progress. Model (9) is under construction.

(Editor's note - This is an extension of former project (668).)

.....

CASE SCHOOL OF APPLIED SCIENCE.

(730) (a) MAHONING DAM SPILLWAY DESIGN.
(b) U. S. Engineer Office, Pittsburgh, Pennsylvania.
(c) Flood control project.
(d) Professor George E. Barnes and Staff.
(e) Professor George E. Barnes.
(f) To determine negative head on crest with sprouting velocities under crest gates; to determine features of conduit portal, and proper design for bucket and apron to dissipate energy from combined spillway and conduit discharge.
(g) 1 : 48 scale model-Ogee section, crest gates and piers, bucket and apron, conduits through dam. Model of section of spillway in glass flume.
(h) Model under construction.

.....

(731) (a) MAHONING DAM - STUDY OF SLUICES.
(b) U. S. Engineer Office, Pittsburgh, Pennsylvania.
(c) Flood control project.
(d) Professor George E. Barnes and Staff.
(e) Professor George E. Barnes.
(f) To determine proper design for bellmouth intake to sluices, and action of control gates, air vents, etc., under various conditions of operation.
(g) 1 : 25 scale model, conduit of pyralin, including trash racks.
(h) Model under construction.

.....

(732) (a) MAHONING DAM - CHANNEL MODEL.
(b) U. S. Engineer Office, Pittsburgh, Pennsylvania.
(c) Flood control project.
(d) Professor George E. Barnes and Staff.
(e) Professor George E. Barnes.
(f) To determine overall performance of complete model, including all features developed in the studies given in projects (730) and (731), with particular reference to channel currents and scour.
(g) 1 : 72 scale model, including section of reservoirs and channel downstream.
(h) Model under construction.

.....

COLUMBIA UNIVERSITY. (No report received.)

(583) Determination of characteristic "friction factor - Reynolds number" graphs for pitted pipe.

(584) Flow through granular materials.

(585) The hydraulic jump in a sloping channel.

(586) A study of submerged flow.

.....

CORNELL UNIVERSITY.

(587) (a) LARGE A.S.M.E. FLOW NOZZLES WITH WATER.
(c) Cooperative research.
(e) H. S. Bean, National Bureau of Standards.
(h) Tests on the three nozzles have been completed.
(b),(d),(f), and (g) See complete report of this project in Bulletin V-2, page 22.

.....

(588) (a) SMALL WOODEN FLUME.
(c) General scientific research.
(e) Prof. E. W. Schoder or Mr. A. H. Vanderlip.
(h) Work under way on a second slope about ten times the first; scant spare time available recently.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 22.

.....

(589) (a) NORMAL DISTRIBUTION OF VELOCITIES FOR WATER IN BRASS PIPE.
(c) Graduate thesis.
(e) Prof. E. W. Schoder.
(h) Thesis completed.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 22.

.....

(590) (a) CHENANGO RIVER MODEL TEST.
(c) Cooperative engineering research.
(e) Binghamton, N. Y., District Office, U. S. Engineers.
(h) Work still in progress. Following extended comparisons of the flow in river and model the effects of closing off the State Street Canal, and of a variety of suggested improvements between Noyes Island and Court Street Bridge, have been studied.
(i) The Chenango flows into the Susquehanna at Binghamton. The backwater effects are nearly as important as the Chenango flow. Progress reports to the Binghamton District Office are being made.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 22.

.....

(672) (a) FLOW NOZZLE RESEARCH.
(c) Calibration of standard flow nozzles.
(e) Prof. F. G. Switzer.
(h) Seven nozzles for 4-in. pipe line have been tested.
(b), (d), (f) and (g), See complete report of this project, in Bulletin V-2, page 23.

.....

(733) (a) SCOUR PREVENTION AT TOE OF SPILLWAY DAM WITH LOW TAILWATER.
(b) Appalachian Electric Power Co.
(c) Engineering research.
(d) Arthur N. Vanderlip, with E. W. Schoder in advisory capacity.
(e) Col. F. W. Scheidenhelm, Consulting Engineer, New York, N.Y.
(f) To assist design of Claytor Dam, New River near Radford, Va., now under construction.
(g) A 1:20 scale model of the dam with four of the actual nine bays and crest lift gates; fine gravel as indicator in river bed downstream; various kinds of single and double baffle sills, with modofications in bucket, step, and apron; various gate openings.
(h) Experiments in progress.
(i) River conditions more severe than for average case.

.....

(734) (a) TRAJECTORY OF WATER SHEET ESCAPING UNDER CREST LIFT GATES, WITH RESPECT TO CURVE OF OGEE DAM.
(b) Appalachian Electric Power Co.
(c) Engineering research.
(d) Arthur N. Vanderlip, with E. W. Schoder, in advisory capacity.
(e) Col. F. W. Scheidenhelm, Consulting Engineer, New York, N. Y.
(f) To assist design of Claytor Dam, New River near Radford, Va., now under construction.
(g) A 1:4 scale model of a portion of one bay; trajectories observed without presence of downstream part of dam, and with various extents of downstream face of dam, for several parabolas; piezometric measurements for suction or pressure at face of dam.

(h) Work completed.
(i) Observations were made by F. H. Stearns and E. W. Schoder on the overfalling sheet in one of the bays of the Conowingo Dam with gate openings up to 8 ft. for auxiliary evidence.

.....

(735) (a) DROP STRUCTURES FOR SMALL STREAMS WITH HEAVY BED LOAD IN FLOODS.
(b) U. S. Engineers, Binghamton, N. Y., District.
(c) Engineering research.
(d) Norman A. Nielson and Cyrus L. Peterson.
(e) Binghamton, N. Y., District Office, U. S. Engineers.
(f) Protection of bed and banks of the small streams, and prevention of debris movement into larger streams with consequent higher flood levels.
(g) Work with 1:30 scale models for half-stream, various backwaters. Crib, Flume, Staggered Piling, and Hinged Apron types were studied.
(h) Work completed.

.....

(736) (a) DISCHARGE COEFFICIENTS OF MUD-SILL TAINTER GATES.
(c) Graduate thesis.
(d) Lts. Cyrus L. Peterson and Charles B. Rynearson.
(e) Prof. E. W. Schoder.
(f) To find capacity of gates at Cayuga Lake outlet works.
(g) A steel model in a flume 2 ft wide; several levels upstream and downstream; volumetric measurements of flow.
(h) Thesis completed.

.....

(737) (a) AXIAL FLOW PUMP DESIGN.
(b) Graduate thesis.
(c) Development of an axial flow pump with high entrance and discharge velocities which might prove suitable for the jet propulsion of ships.
(d) F. S. Erdman.
(e) Prof. F. G. Switzer.
(f) See (c) above.
(g) A standard pump of the axial flow type is to be tested, redesigned, and retested to achieve the desired result.
(h) Plans being made to start soon.
(i) No report yet available.

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UNIVERSITY OF FLORIDA. (No report received.)

(531) Model test of a laboratory venturi flume.

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HARVARD UNIVERSITY. (No report received.)

(674) Seepage through dams.

(675) Investigation of a new method for determining the coefficient of permeability of the soil in the ground.

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HORTON HYDRAULIC AND HYDROLOGIC LABORATORY.

(290) (a) VELOCITY DISTRIBUTION IN STREAM CHANNELS.
(c) Scientific research.
(e) Robert E. Horton.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 25.

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(291) (a) BACK-WATER BY THE MANNING FORMULA.
(c) Scientific research.
(e) Robert E. Horton.
(b), (d), (f) and (g), See complete report of this project in Bulletin V-2, page 25.

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(292) (a) DISPERSION CURVES OF MANNING'S COEFFICIENT OF ROUGHNESS.
(c) Scientific research.
(e) Robert E. Horton.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 26.

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(293) (a) FLOOD WAVES SUBJECT TO FRICTION CONTROL.
(c) Scientific research.
(e) Robert E. Horton.
(h) A paper "Classification of Flood Waves", by R. E. Horton, will appear shortly in the Bulletin of the International Association of Navigation Congresses, General Secretary's Office, 38 Rue de Louvain, Brussels, Belgium.
(b), (d),(f) and (g) See complete report of this project in Bulletin V-2, page 26.

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(294) (a) RELATION OF CARRYING CAPACITY OF CAST IRON PIPE CONDUITS TO AGE IN SERVICE.
(c) Scientific research.
(e) Robert E. Horton.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 27.

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(385) (a) SURFACE RUNOFF PHENOMENA.
(c) Scientific research.
(e) Robert E. Horton.
(h) A report, "Preliminary Outline for Comprehensive Research on Runoff Phenomena", has been prepared by R. E. Horton, and copies will be furnished without charge to hydraulic laboratories on application.
(b), (d) and (f). See complete report of this project in Bulletin V-2, page 27.

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(386) (a) WIND VELOCITY NEAR THE GROUND.
(c) Scientific research.
(e) Robert E. Horton.
(b), (d), (f) and (g), See complete report of this project in Bulletin V-2, page 27.

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(738) (a) SURFACE RUNOFF PHENOMENA - CHANNEL PHASE.
(b) Scientific research.
(c) Scientific research.
(d) Robert E. Horton and Laboratory staff.
(e) Robert E. Horton.
(g) An application of the Manning formula and the equation of continuity or storage equation to the determination of the transformation of a stream rise in its course through stream channels. The method is based on channel storage, and the research includes:
(1) Development of methods of determining the volume of channel storage from hydrographs, including determination of stream widths and channel storage volumes for rising and receding stages during the passage of a stream rise;
(2) Application of the stream stage-storage relations to determination of channel-inflow graph from channel-outflow graph;
(3) Effect of various factors, such as volume of channel storage and location of area from which surface runoff is derived on form of channel-outflow graph;
( ) Synthesis of channel-outflow graphs from channel - inflow graph or surface-runoff graph.
(h) This research has reached the point where the results are being worked up for publication.

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Publications available. Copies of the following publications will be furnished without charge to hydraulic laboratories, upon application:
"Hydrologic Research", by R. E. Horton, Science, Vol. 86, No. 2241, Dec. 10, 1937, pp. 527-550.
"List of Publications, with Abstracts", by R. E. Horton, Publication No. 112, Horton Hydrologic Laboratory.

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UNIVERSITY OF ILLINOIS.

(301) (a) STUDY OF THE FLOW OF WATER IN A CIRCULAR GLASS PIPE BY THE USE OF MOTION PICTURES.
(c) Laboratory investigation.
(e) Prof. F. B. Seely.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 28.

(504) (a) MODEL OF SPILLWAYS OF WATER SUPPLY RESERVOIRS IN ILLINOIS.
(c) Investigation of capacities, use as measuring devices and erosion problems.
(e) Prof. F. B. Seely.
(h) Tests of West Frankfort model are completed and the results published in Circular 30 by the Illinois State Water Survey, Urbana, Illinois.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 29.

(626) (a) VELOCITY DISTRIBUTION IN PIPES AT HIGH REYNOLDS NUMBER.
(c) Research.
(e) Prof. F. B. Seely.
(h) Experiments in progress. Thesis will probably be completed February 1, 1938.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 29.

(655) (a) THE DEVELOPMENT OF A MAGNETIC INSTRUMENT FOR MEASURING THE FLOW OF FLUIDS IN PIPES.
(c) Research.
(e) Prof. F. B. Seely.
(h) Tests have been made using magnets of various shapes and sizes in three pipes of different diameters (3 in., 2 in., and 1 in. in diameter). A copy of the thesis is now on file in the University Library. Tests are being extended to include pipes of 6-in. or 8-in. diameter.
(b), (d), (f) and (g) See complete report in Bulletin V-2, page 29.

(739) (a) EFFECT OF RADIUS OF CURVATURE ON THE FLOW OF WATER AROUND PIPE BENDS.
(c) Research.
(d) J. M. Robertson, W. M. Lansford.
(e) Prof. F. B. Seely.
(f) To study the effect of the radius of curvature of a 90-degree bend on the flow of water through the bend.

(g) Tests are now being made on six pairs of carefully made cast iron elbows, having diameters of 2, 4 and 8 in. and ratios of radii of curvature of the bend to diameter of the bend of 0.8, 1.0, 1.5 and 2.0. A part of this investigation is an extension of the work reported in Bulletin 296, Eng. Exp. Sta., Univ. of Illinois.
(h) Tests in progress.

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(740) (a) THE HYDRAULICS OF THE FLOW OF SEWAGE SLUDGE.
(b) Engineering Experiment Station.
(c) Scientific research.
(d) H. E. Babbitt.
(e) Prof. H. E. Babbitt.
(h) Preliminary apparatus completed and at present work is being planned regarding final tests.

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IOWA INSTITUTE OF HYDRAULIC RESEARCH.

(306) (a) HYDRAULIC STUDIES OF A MODEL OF THE UNIVERSITY DAM AT IOWA CITY.
(c) Graduate thesis.
(d) Edward Soucek and C. L. Morgan.
(e) Prof. F. T. Mavis.
(b),(f) and (g) See complete report of this project in Bulletin IV-1, p. 17.

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(314) (a) LABORATORY STUDIES OF GROUND WATER PROFILES.
(c) Graduate thesis.
(e) Prof. F. T. Mavis.
(h) Completed and scheduled for publication as a bulletin in the University of Iowa Studies in Engineering.
(b), (d) See report of this project in Bulletin V-2, page 30.

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(316) (a) HYDROLOGIC STUDIES -RALSTON CREEK WATERSHED.
(c) Cooperative project - Iowa Institute of Hydraulic Research, U. S. Department of Agriculture, and U. S. Geological Survey.
(e) Prof. E. W. Lane.

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(317) (a) COOPERATIVE STREAM GAGING IN IOWA.
(c) Cooperative project - U. S. Geological Survey.
(e) Prof. E. W. Lane.
(b), and (d) See report of this project in Bulletin V-2, page 30.

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(455) (a) FUNCTIONAL DESIGN OF FLOOD CONTROL RESERVOIRS.
(c) Graduate thesis.
(e) Prof. C. J. Posey.
(h) Scheduled for completion in June 1938.
(b),(d) and (f) See report on this project in Bulletin V-2, page 30.

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(456) (a) THE HYDRAULIC JUMP IN ENCLOSED CONDUITS.
(c) Graduate thesis.
(e) Prof. E. W. Lane.
(h) Completed.
(i) Paper scheduled for publication by Engineering News-Record.
(b) (d) and (f) See complete report on this project in Bulletin V-2, page 31.

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(506) (a) THE EFFECT OF SCALE-RATIO ON SCOUR BELOW MODEL STILLING POOLS.
(c) Graduate college project and thesis.
(e) Prof. E. W. Lane.
(h) Completed.
(b),(d) and (f) See complete report of this project in Bulletin V-2, page 31.

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(507) (a) THE CONVERSION OF KINETIC INTO POTENTIAL ENERGY.
(c) Cooperative research with Committee on Hydraulic Research, American Society of Civil Engineers.
(e) Prof. F. T. Mavis.
(h) Preliminary studies of flow in a transparent expanding conduit have been completed, and further studies are in progress.
(b), (d) and (f) See complete report of this project in Bulletin V-2, p. 31.

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(593) (a) A STUDY OF PERCOLATION UNDER EXISTING DAMS BY MEANS OF THE ELECTRICAL ANALOGY.
(c) Graduate thesis.
(e) Prof. E. W. Lane.
(h) Completed.
(b), (d) and (f) See complete report of this project in Bulletin V-2, p. 31.

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(595) (a) A STUDY OF THE CARRYING CAPACITY OF RIVERS FOR SILT IN SUSPENSION.
(c) Research in cooperation with the U. S. War Department and other government agencies, also graduate thesis.
(e) Prof. E. W. Lane.
(b),(d) and (f) See complete report of this project in Bulletin V-2, p. 32.

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(596) (a) MODEL STUDY OF RALSTON CREEK CONTROL.
(c) Graduate thesis.
(e) Prof. F. T. Mavis.
(h) Tests and report on two models and prototype completed, but not yet edited for publication.
(b), (d) and (f) See complete report of this project in Bulletin V-2, p. 32.

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(597) (a) CONTROL OF SILT DEPOSITS NEAR CONDENSER INTAKES OF A STEAM POWER PLANT.
(c) Graduate thesis.
(e) Prof. F. T. Mavis.
(h) Study and reports completed but unpublished.
(b), (d) and (f) See complete report of this project in Bulletin V-2, p. 32.

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(598) (a) MODEL DRAFT TUBE STUDIES.
(c) Graduate thesis.
(d) Prof. F. T. Mavis, Andreas Luksch, and H. H. Chang.
(e) Prof. F. T. Mavis.
(h) Completed and being edited for publication.
(b) and (f) See complete report of this project in Bulletin V-2, p. 32.

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(599) (a) STUDY OF VACUUM FORMATIONS IN WATER SUPPLY SYSTEMS OF BUILDINGS.
(c) Institute project.
(e) Dean F. M. Dawson.
(h) Experimental work is completed.
(i) Final report was rendered Oct. 1937 to the National Association of Master Plumbers, Inc., Edmonds Bldg., 917 Fifteenth St., N. W., Washington, D. C. Printed copies will be available January 1938.
(b), (d) and (f) See complete report of this project in Bulletin V-2, p. 32.

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(600) (a) HYDRAULICS OF VERTICAL STACKS WITH VARIOUS CONNECTING DRAINS.
(c) Institute project.
(e) Dean F. M. Dawson.
(h) Preliminary qualitative tests have been made. Quantitative work now in progress.
(i) A progress report on this subject has been published as Bulletin No. 10, State University of Iowa Studies in Engineering, entitled, "Hydraulics and Pneumatics of Plumbing Drainage Systems -- I".
(b), (d) and (g) See complete report of this project in Bulletin V-2, p. 33.

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(602) (a) HYDRAULIC JUMP IN TRAPEZOIDAL CHANNELS.
(c) Graduate thesis.
(e) Prof. C. J. Posey.
(h) Completed. To be published in Engineering News-Record.
(b), (d) and (f) See complete report of this project in Bulletin V-2, p. 33.

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(604) (a) DETERMINATION OF COEFFICIENT OF DISCHARGE OF TAINTER GATE OVER HORIZONTAL SILL.
(c) Graduate thesis.
(e) Prof. J. W. Howe.
(h) Completed.
(b), (d), (f) and (g), See complete report of this project in Bulletin V-2, pp. 34-35.

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(741) (a) BED MOVEMENT AND HYDRAULIC ROUGHNESS CHANGES IN THE LOWER MISSISSIPPI RIVER.
(c) Graduate thesis.
(d) Prof. E. W. Lane, and E. W. Eden, Jr.
(e) Prof. E. W. Lane.
(f) To investigate the conditions giving rise to sand waves in large rivers and their effect on the hydraulic roughness of the river channels.

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(742) (a) TRACTION OF PEBBLES BY FLOWING WATER.
(c) Graduate thesis.
(d) Edward Soucek, John Bogardi, and C. H. Yen.
(e) Prof. F. T. Mavis.
(f) Continuation of previous laboratory studies of bed load transportation.
(i) Similar to project (311) reported in Bulletin V-2, p. 30, and abstracted in this issue.

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(743) (a) SIMULTANEOUS FLOW OF AIR AND WATER IN CLOSED CONDUITS.
(b) Iowa Institute of Hydraulic Research.
(c) Cooperative research.
(d) Dean F. M. Dawson and A. A. Kalinske.
(e) Dean F. M. Dawson.
(f) To obtain basic data on the flow of water in partly full conduits when air is being dragged along, when the air is flowing faster than the water, and when the air flows counter to the direction of the water. Both vertical and sloping conduits will be used in the experiments.
(g) Surface friction between air and water interface will be investigated. In sloping conduits the problem of non-uniform flow due to variation of air pressure along the conduit is the particular problem that is to be investigated.
(h) Design of the experimental apparatus is under way, and test techniques are being developed.

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(169) (a) STUDY TO IMPROVE HYDRAULIC SYSTEM OF NAVIGATION LOCKS, GENERAL MODEL.
(c) Design project and graduate thesis.
(e) Martin E. Nelson, Associate Engineer.
(h) A square-cornered filling and emptying port was calibrated to provide data for the final report now in preparation.
(b), (d), (f), and (g) See complete report of this project in Bulletin V-2, p. 37.

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(390) (a) MISSISSIPPI RIVER, LOCK & DAM NO. 11, DUBUQUE, IOWA.
(c) Design project and operations study.
(e) Martin E. Nelson, Associate Engineer.
(h) Additional tests were made to determine scour in a bed of crushed coal downstream from the model dam for comparison with prototype erosion.
(b), (d), (f), and (g) See complete reports of this project in Bulletins IV-2, page 17, and V-2, page 38.

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(447) (a) TAINTER GATE COEFFICIENTS.
(c) Research project and operations study.
(e) Martin E. Nelson, Associate Engineer.
(h) Calibration of model Tainter gates has been completed, data have been analyzed, and a report is in preparation
(b), (d), (f), and (g) See complete report of this project in Bulletin V-2, page 40.

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(448) (a) WEEP HOLES.
(c) Research project.
(e) Martin E. Nelson, Associate Engineer.
(h) Tests have been made on a conical weep hole 6 in. in diameter at the top, 10 in. in diameter at the bottom, and 4 ft long, filled with crushed stone.
(i) Additional tests are in progress on a weep hole similar to the above but inverted.
(b), (d), (f), and (g) See complete report of this project in Bulletin V-2, page 40.

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(517) (a) PILE FOUNDATION TESTS.
(c) Research project.
(e) Martin E. Nelson, Associate Engineer.
(h) Direct-bearing tests on single model piles have been made.
(b), (d), (f), and (g). See complete report of this project in Bulletin V-2, page 41.

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(607) (a) CHANOINE WICKET CALIBRATION.
(c) Research project and operations study.
(e) Martin E. Nelson, Associate Engineer.
(h) Tests have been completed and a report is in preparation.
(b), (d), (f), and (g). See complete report of this project in Bulletin V-2, page 42.

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(651) (a) TENNESSEE RIVER, GENERAL JOE WHEELER LOCK.
(c) Operations study.
(e) Martin E. Nelson, Associate Engineer.
(h) A filling and emptying port for this structure has been calibrated over the range of conditions that exists at the prototype.
(b), (d), (f), and (g). See complete report of this project in Bulletin V-2, page 42.

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(744) (a) HYDRAULIC LABORATORY INSTRUMENTS.
(b) Corps of Engineers, U.S.Army, St. Paul District.
(c) Design project.
(d) Clinton H. Smoke, Junior Engineer, U. S. Engineer Department.
(e) Martin E. Nelson, Associate Engineer.
(f) To develop and improve instruments required in the investigation of hydraulic problems.
(g) Instruments will be developed along theoretical lines and modified to meet practical requirements. Especial attention will be given to instruments necessary for the study of fluid mechanics.
(h) A frictionless, electrical counter has been designed for use with small current meters.

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(745) (a) MISSISSIPPI RIVER, NEW LOCK NO. 2, HASTINGS, MINN.
(b) Corps pf Engineers U. S. Army, St. Paul District.
(c) Design project and operations study.
(d) U. S. Engineer Department staff.
(e) Martin E. Nelson, Associate Engineer.
(f) To study navigation conditions and possible silting in the channels leading to a second lock proposed for the dam at Hastings.
(g) Investigations will be carried out in a river model 1 /100 prototype in horizontal dimensions and 1/40 prototype in vertical dimensions. Using crushed coal as a medium, deposition will be studied in several arrangements of lock approach channel throughout the range of a typical hydrograph.
(h) Tests have been started.

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LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE.

(28). (a). HYDROLOGICAL STUDY OF CITY PARK LAKE DRAINAGE AREA.
(c) General scientific research.
(e) Dr. Glen N. Cox.
(h) Records have been taken since April 1, 1933.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 43.

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(224) (a) FACTORS AFFECTING THE EVAPORATION FROM A LAND PAN.
(c) General scientific research.
(e) Dr. Glen N. Cox.
(h) Records have been taken since June 1, 1933.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 43.

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(225) (a) COMPARISON OF EVAPORATION BETWEEN A LAND PAN AND A FLOATING PAN.
(c) General scientific research.
(e) Dr. Glen N. Cox.
(h) Records have been taken since October 1933.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 43.

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(746) (a) THE TRANSPORTATION OF MATERIALS BY HYDRAULIC DREDGE.
(b) General research in connection with thesis for Master's degree.
(d) Graduate student under Dr. Glen N. Cox.
(e) Dr. Glen N. Cox.
(f) and (g) The data from the operation of a number of dredges were used to determine the losses in the pipe line. The data were observed *on dredges ranging from 18 in. to 27 in. which were operating in the Atchafalaya River Basin. The friction factor was determined for the different heads, pipe sizes and lengths, load contents, etc. (h) Thesis nearly complete

* by the U.S.Engineers

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

(747) (a) AN EXPERIMENTAL INVESTIGATION OF THE EFFECTS OF THE APPROACHING SEA DEPTH AND THE DIMENSIONS OF THE ROCK MOUND FOUNDATION ON THE WAVE ACTION ON VERTICAL BREAKWATERS.
(b) River Hydraulic Laboratory, M.I.T.
(c) Graduate research for Master's degree.
(d) R. S. Hsu.
(e) Prof. K. C. Reynolds.
(f) Experimental study of distribution and intensity of pressure of waves striking a breakwater.
(g) A plunger at one end of a wave tank creates waves which strike a breakwater at the opposite end. By means of specially designed microphones the pressure diagram will be obtained for four different elevations on the breakwater.
(h) Apparatus is being assembled.

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UNIVERSITY OF MINNESOTA.

(94) (a) TRANSPORTATION OF SEDIMENT.
(c) University hydraulics research project.
(e) Prof. Lorenz G. Straub.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 46.

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(99) (a) LAWS OF HYDRAULIC SIMILITUDE.
(c) University hydraulics research project.
(e) Prof. Lorenz G. Straub.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 46.

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(190) (a) FLOW CONDITIONS IN OPEN CHANNEL.
(c) University hydraulics research project.
(e) Prof. Lorenz G. Straub.
(b), (f) and (g) See complete report of this project in Bulletin V-2, page 47.

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(327) (a) EXPERIMENTAL STUDY OF FLUSH VALVES FOR WATER-CLOSETS.
(c) Cooperative research project with Sanitary Division of Minnesota State Board of Health and the Hydraulics Department of the University.
(e) Prof. Lorenz G. Straub.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 47.

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(676) (a) FRICTION LOSS IN PLUMBING SYSTEM PIPE LINES.
(c) Cooperative research project with the Sanitary Division of the Minnesota State Board of Health and the Hydraulics Department of the University of Minnesota.
(e) Prof. Lorenz G. Straub.
(b),(d), (f) and (g) See complete report of this project in Bulletin V-2, page 47.

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(677) (a) SEDIMENTATION AT THE CONFLUENCE OF RIVERS.
(b) In cooperation with the Special Committee on Hydraulic Research of the American Society of Civil Engineers.
(d) Lorenz G. Straub and Robert H. Gedney.
(e) Prof. Lorenz G. Straub.
(f) and (g) See complete report of this project in Bulletin V-2, page 47.

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(678) (a) STUDY OF WIND-GENERATED WAVES.
(e) Prof. Lorenz G. Straub.
(b), (d) and (g) See complete report of this project in Bulletin V-2, page 48.

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(679) (a) STABILITY OF SAND DAMS.
(e) Prof. Lorenz G. Straub.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 48.

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NEW YORK UNIVERSITY.

(748) (a) INVESTIGATION OF STUB SPONSONS ATTACHED TO FLYING BOAT HULLS.
(b) Daniel Guggenheim School of Aeronautics, College of Engineering, New York University.
(d) Michael Phillips, Neal Tetervin and Arthus Schnitt.
(e) Dr. Alexander Klemin and Prof. F. K. Teichmann.
(f) To determine the best position of airfoil type stub sponsons attached to a flying boat hull.
(g) A model of a flying boat hull was tested with and without stub sponsons for resistance, moments, and water behavior.
(h) Completed.
(i) Reported in thesis on file in University Library.

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(749) (a) CALIBRATION OF NEW YORK UNIVERSITY 150-ft TOWING BASIN.
(b) Daniel Guggenheim School of Aeronautics, College of Engineering, New York University.
(d) J. V. Becker and V. Condello.
(e) Dr. Alexander Klemin and Prof. F. K. Teichmann.
(f) To calibrate the 150-foot towing basin for investigating characteristics of seaplane floats.

(g) In addition to routine calibration tests, a model of a seaplane float which had been tested at the Washington Navy Yard was tested in the New York University basin and the characteristics obtained were compared with those obtained at Washington Navy Yard.
(h) Completed.
(i) Thesis for Master of Seience degree on file in the library of the Daniel Guggenheim School of Aeronauties.

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(750) (a) LOSSES OF HEAD WITH AIR AT LOW PRESSURES.
(b) New York University.
(c) Measurement of frictional resistance in a long length of $2\frac{1}{2}$-in. steel pipe, and losses through silencers.
(d) Theodore Randall and J. K. Vennard.
(e) Prof. Lewis V. Carpenter.
(f) To study effeets of silencers on both the inlet and outlet of a Root-Connersville blower and to check up on coeffieients for a $2\frac{1}{2}$-inch steel pipe line under low pressures and large volumes.
(g) A straight length of $2\frac{1}{2}$-ineh steel pipe will be installed with appropriate gages for measuring pressure and volume of flow. Power measurements will be recorded. The effeet of silencers on both inlet and outlet end will be studied.
(h) Work just started.

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(751) (a) HYDRAULICS OF SURFACE FILTER WASH.
(b) New York University.
(c) A study of the loss of head in orifiees used in the surface washing systems and the sand expansion with various volumes of water being used through the filter bottom, and the surface wash system.
(d) Raymond Althouse.
(e) Prof. Lewis V. Carpenter.
(f) To obtain data for proper hydraulic design of surfaee wash-water systems.
(g) A steel filter, three $\frac{ft}{s}$ square, has been constructed with an Aloxite Filter bottom and a surface wash system. Various sizes of filter sand will be used and the hydraulic losses will be obtained over wide ranges.
(h) Experimental work completed on one size and four depths of sand.
(i) Work will be continued.

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OHIO STATE UNIVERSITY. (No report received.)

(458) Calibration of a venturi meter for a large range of Reynolds numbers.

(525) Calibration of pipe orifices with steam.

(526) Determination of discharge coefficients of flow nozzles.

(636) Study of the effect of pulsations on orifice meters.

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THE UNIVERSITY OF OKLAHOMA. (No report received.)

(617) Determination of discharge coefficients for flow nozzles and square-edged orifices when metering oil. (Cooperative research project sponsored by the Special Research Committee on Fluid Meters of the A.S.M.E.)

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OREGON STATE COLLEGE.

(681) (a) FLOW AROUND BENDS IN OPEN CHANNELS.
(b) Committee on Hydraulic Research, Am. Soc. C. E.
J. C. Stevens, Chairman, Portland, Oregon.
(c) A research project on flow around bends in open channels.
(d) C. A. Mockmore, Corvallis, Oregon, and Fred Merryfield.
(e) Prof. C. A. Mockmore, Corvallis, Oregon.
(g) An open channel, 18 inches wide and 10 inches deep, with several bend sections of 30-inch central radius have been designed and built to permit varying flow conditions.
(h) Taking of experimental data now under way.

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(682) (a) A STUDY OF RECTANGULAR SHARP-CRESTED WEIRS OF WIDE VARIATION OF L/H RATIO.
(c) Research project in Civil Engineering.
(d) C. A. Mockmore and Fred Merryfield.
(e) Prof. C. A. Mockmore, Corvallis, Oregon.
(g) Project is continuation of an experiment conducted as an undergraduate thesis.
(h) Undergraduate thesis available for loan.
(b) and (f) See complete report of this project in Bulletin V-2, page 52.

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(684) (a) A STUDY OF THE GATING OF PROPELLER.
(c) Graduate thesis for advanced degree.
(e) Prof. C. A. Mockmore and Prof. Fred Merryfield.
(h) A 10-horsepower turbine of 7-inch runner diameter has been designed, built and tested in the laboratory. Work in progress on effect of varying hub diameter for the runner. (b), (d) and (f) See complete report of this project in Bulletin V-2, page 53.

PACIFIC HYDROLOGIC LABORATORY.

(752) (a) STUDY OF REMOVAL OF SALT WATER FROM DREDGER-FILL BY DRAINAGE AND LEACHING.
(b) Golden Gate International Exposition, San Francisco, Calif.
(c) Laboratory and field research.
(d) Charles H. Lee.
(e) Charles H. Lee, Consulting Engineer.
(f) To determine an inexpensive and rapid method for reducing ground-water level and salinity in a new dredger-fill to the point where any variety of horticultural vegetation can be planted without injury or retarded growth. The dredger-fill is composed of material excavated from the bottom of San Francisco Bay and is largely fine sand with occasional balls of blue marine clay and thin layers of clay. The central portion of the fill is saturated with salt water to within one ft of the surface and all portions are impregnated with salt. Water level must be lowered to at least 6.5 ft below the surface, and chlorine content of the soil must be reduced from over 5000 ppm to less than 100 ppm.
(g) The proposed method of accomplishing the desired result is, (1) to remove all free gravity water by drainage either through gravity drain ditches or from pumped wells, (2) to leach out salinity remaining in the fine sand by natural rainfall or by sprinkling surface with fresh water, (3) to remove or buffer against salinity in clays by use of gypsum or other flocculating agency which will increase the permeability of the clay and facilitate leaching as well as remove salt from solution.
(h) Laboratory and field tests upon fine sand have been completed. Tests upon clay are still in progress.
(i) Report being submitted to Director of Works, Golden Gate International Exposition.

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PENNSYLVANIA STATE COLLEGE. (No report received.)

(137) A study of various types and kinds of stilling devices for use in channels of approach to weirs and for other purposes.

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UNIVERSITY OF PENNSYLVANIA.

(753) (a) CALIBRATION OF AM. SOC. MECHANICAL ENGRS. FLOW NOZZLES.
(b) A. S. M. E. Fluid Meters Committee.
(c) Accurate tests for coefficients.
(d) W. S. Pardoe.
(e) Prof. W. S. Pardoe.

(f) The development of a standard A.S.M.E. Flow Nozzle.
(g) Nozzles of various diameters, forms and proportions are tested in different-sized pipes up to flows of twelve cfs.
(h) To date, ten calibrations of seven nozzles have been made.
(i) The methods used are outlined in Trans. A.S.M.E., Nov.,1936.

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PENNSYLVANIA WATER AND POWER COMPANY.

(228) (a) RESISTANCE OF ALLOYS TO CAVITATION - HIGH HEAD TESTS AT HOLTWOOD.
(c) Commercial research.
(e) J. M. Mousson.
(h) Completed. Progress reports:
H. N. Boetcher, Trans. A.S.M.E. July, 1936, Vol. 58, No. 5.
H. N. Boetcher, Z. VDI, Dec., 1936, Vol. 80, No. 50.
(i) Final reports:
J. M. Mousson, Trans. A.S.M.E. July, 1937, Vol. 59, No. 5.
J. M. Mousson, E.E.I. Bulletin, Sept. and Oct., 1937, Vol. 5, No. 9 and No. 10.
(b), (d), (f) and (g) See complete report of this project in Bulletin IV-2, page 40.

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PRINCETON UNIVERSITY. (No report received.)

(686) Results of cavitation research at Princeton University.
(687) Effect of down-stream conditions on the coefficients of a rounded nozzle.
(688) Effect of blade-pitch angle on current meter characteristics.
(689) Effect of guide rings on the characteristics of a propeller type current meter.
(690) Flow in an open channel with downwardly sloping floor.

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PURDUE UNIVERSITY. (No report received.)

(47) Flow of fluids through circular orifices and triangular weirs.

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UNIVERSITY OF ROCHESTER. (No report received.)

(691) Study of flow through valves.

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S. MORGAN SMITH COMPANY.

(754) (a) SINGLE HORIZONTAL NOZZLE IMPULSE TURBINE EFFICIENCY AND HORSEPOWER TESTS.
(b) Ministry of Public Works, Nuevo Acueducto de Bogota, Vitalma Purification Works.
(c) Commercial research.
(d) R. Sahle, H. Bennett, and testing crew for the S. Morgan Smith Company, Mr. Thomas Hallinan for the Ministry of Public Works, Nuevo Acueducto de Bogota, Vitelma Purification Works.
(e) Engineering Department, George A. Jessop, Chief Engineer.
(f) To determine the horse power and efficiency of the full size turbine in its permanent field setting. To determine the discharge of the relief nozzle as well as that of the power nozzle.
(g) The completed unit of a commercial size impulse wheel was installed with its governor and pump in the laboratory. The unit consisted of a horizontal impulse runner, casing and power and relief nozzles. The power nozzle was direct connected to an oil-pressure governor which operated the needle through its required stroke. The governor was also connected by means of levers to a cam which rotated with the stroke of the governor. This cam actuates a small pilot valve which controls the operation of an oil servo-motor connected to the relief needle. The relief nozzle acts as a synchronous by-pass, the needle moving in the opposite direction from the power needle.

The horse power and efficiency of the impulse wheel was determined. The discharge of the power nozzle and of the relief nozzle was measured and the cam was so shaped as to secure a constant quantity from the two nozzles.

The operating head was measured by multiple piezometers located in the needle casing, the horse power was determined by an Alden dynamometer and Fairbanks precision scale and the discharge was measured by a four-foot weir. The speed counter was thrown in and out of mesh by an electric time clock.

Two runners were tested, one having 18 and the other 24 buckets, both using the same power nozzle. A thorough study was made of the discharge from the two sets of buckets.

(h) Tests are completed.

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(755) (a) AXIAL FLOW PUMP EFFICIENCY, HORSEPOWER AND DISCHARGE TESTS.
(b) Iowa Public Service Corporation, Stevens and Woods Incorporated Engineers, Aldrich Pump Company, Allentown, Pa.
(c) Commercial research.

(d) R. Sahle, H. Bennett and testing crew for the S. Morgan Smith Company, B. F. Woods of Stevens and Woods Incorporated Engineers, Mr. Mulheron, Sterling Smith and S. C. Flueso of the Aldrich Pump Company.
(e) Engineering Department, George A. Jessop, Chief Engineer.
(f) To determine the discharge in gallons per minute, the horsepower and efficiency of a full size axial flow pump under the field head.
(g) The pump and direct-connected motor was mounted in the hydraulic laboratory with the intake two feet below tailwater elevation. The impeller was above tailwater and priming was required. This was accomplished by starting the pump and then admitting water to the discharge side. From the discharge elbow the water was carried by piping to the upstream end of the weir channel from whence it flowed through baffles and screens to a seven-ft measuring weir. A differential mercury column was used to measure the dynamic head on the pump, one set of piezometers being connected to the suction under the impeller and one set to the discharge pipe downstream from the elbow. The motor had been carefully rated for efficiency and the power input was measured by calibrated instruments. The pump was tested at constant speed and variable head. The starting current was investigated.
(h) Test is completed.
(i) The test was conducted as an acceptance test for the Iowa Public Service Company.

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(756) (a) KAPLAN TURBINE EFFICIENCY AND HORSEPOWER TESTS.
(b) U.S.Engineer Office, Tennessee Valley Authority, Guntersville Power Plant, Knoxville, Tennessee.
(c) Guarantee Tests Research.
(d) J. C. Scoville, R. Sahle, H. Bennett and testing crew for the S. Morgan Smith Company.
(e) Engineering Department, George A. Jessop, Chief Engineer.
(f) To determine the horsepower and efficiency of a full size turbine in its permanent field setting. To select the most efficient design of setting. To obtain complete information so that the turbine can be most efficiently operated over the entire range of head from 18 ft to 42 ft. To determine the best blade-gate relationship under all heads so that the control mechanism may be properly designed.
(g) An exact model was made of the full size runner, gate case, intake, scroll case and draft tube. This complete model was used for all of the tests. The upstream end of the two vertical piers in the draft tube were adjustable and the best locations determined by test. The runner blades were carefully set and locked in a series of six positions, or angles, covering the full stroke. At each position, tests were made at a sufficient number of gate openings so that curves can be drawn to determine the exact openings required to produce maximum efficiency at the particular blade angle under tests.

All of the final tests were conducted over a large range of speed to cover the required proportional speeds as determined by the field head conditions. Sufficient information was obtained to construct correct blade angle-- gate opening curves for all heads which the turbine will operate.

The power was measured by an Alden Absorption dynamometer and a precision beam scale. The head was measured with differential float gages, and the water by a weir. An electric time clock was used and the speed counter was thrown in and out by a solenoid.

The distribution of the water at the draft tube outlet was determined.

(h) Tests now in progress.

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(757) (a) HEAD LOSS, OPERATING TORQUE ON ROTO-VALVE UNDER FREE DISCHARGE CONDITIONS.

(b) S. Morgan Smith Company.

(c) Research.

(d) R. Sahle, H. Bennett and testing crew for the S. Morgan Smith Company.

(e) Engineering Department, George A. Jessop, Chief Engineer.

(f) To determine the head loss and maximum operating torque of a model Roto-valve under free discharge conditions. To measure torque and head loss when air is admitted on the downstream side of the valve plug in order to break the vacuum set up by the free discharge condition.

(g) A model Roto-valve with a straight waterway was placed in a test pipe line connected to a head tank 110 ft high, in which the required head on the valve was maintained. Water was supplied to this tank by means of centrifugal pumps. The quantity of water passing through the valve was measured by a calibrated venturi meter. Piezometers were placed around the test pipe some distance upstream from the valve plug, in order to measure the pressure on the upstream side. Air was admitted to the downstream side of the valve plug through holes fitted with pipes and control valves and atmospheric pressure secured at this point.

The valve was tested at a number of openings and measurements taken of the head, discharge and the torque required to open, close, seat and unseat it.

(h) Tests are completed.

(i) The information obtained is used to design and select discharge Roto-valves and their control mechanisms under free// conditions.

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(758) (a) LOCATION OF IMPELLER IN RELATION TO THE GUIDE VANES IN AN AXIAL FLOW PUMP.
(b) S. Morgan Smith Company.
(c) Research.
(d) R. Sahle, H. Bennett and testing crew for the S. Morgan Smith Company.
(e) Engineering Department, George A. Jessup, Chief Engineer.
(f) To determine the effect on efficiency and discharge of lowering the impeller with respect to stationary guides in the casing.
(g) An axial flow pump was installed in the laboratory. The impeller was made so that it could be placed in three locations below the guide vanes, and efficiency and discharge tests were run at each location.
(h) The tests are completed.
(i) The information obtained will be used in designing casings for axial flow pumps.

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STEVENS INSTITUTE OF TECHNOLOGY. (No report received.)

(378) The study of the forces acting on sailing yachts in actual sailing attitudes.

(638) Towing a sphere under water.

(693) Investigation of the effect of scale on the resistance of small models of seaplane floats.

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THE UNIVERSITY OF TEXAS. (No report received.)

(615) Pressure drop in non-isothermal flow of liquids in brass tubes.

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THE TULANE UNIVERSITY OF LOUISIANA. (No report received.)

(463) Investigation of hydraulic losses at pipe entrances.

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UNION COLLEGE. (No report received.)

(694) An investigation of flow through rectangular slots and extremely small rectangular weirs.

(695) An investigation of splash phenomena.

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STATE COLLEGE OF WASHINGTON. (No report received.)

(628) Resistance of specially designed bends for 6-inch pipe.

(629) Effect of low arch skew bridges on water stages in rectangular flood channels.

(630) Studies of flow in small rectangular flumes.

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UNIVERSITY OF WASHINGTON.

(759) (a) LOWER COLUMBIA RIVER MARTIN ISLAND BAR CHANNEL MAINTENANCE.
(b) Flood control studies of the area of Western Washington, under supervision of the University of Washington, Department of Civil Engineering.
(c) Movable-bed model.
(d) Univ. of Washington Civil Engineering Department and the Portland Office of Army Engineers, with W.P.A. cooperating by supplying labor.
(e) William Morton, Hydraulics Laboratory, Univ. of Washington.
(f) To study the effects of permeable dikes from mile 28 to mile 34.2 below Portland, Oregon. There are 14 of these dikes built to scale in the model region.
(g) Model is of the movable-bed type with automatic sand feeder built to scale 1 ft equals 500 ft horizontal, and 1 ft equals 50 ft, vertical.
(h) Model completed, observation and control of equipment in place; preliminary test runs have been made.
(i) This model will be operated as a research study of open-channel flow and silt movement. It is hoped that alterations in these dikes may be developed which will eliminate the dredging required in this stretch of the river.

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(760) (a) PROPOSED CHANNEL IMPROVEMENT OF THE PUYALLUP RIVER IN TACOMA, WASHINGTON, FOR FLOOD CONTROL.
(b) Control weir studies, development of venturi throats under railroad bridges and determination of hydraulic characteristics of the proposed channel.
(c) Movable-bed model with automatic sand feeder and tilting bed throughout the model length.
(d) Civil Engineering Department of University of Washington; Dept. of Public Works, City of Tacoma; W.P.A. supplying labor; Seattle district U. S. Engineers, and the State of Washington Flood Control Engineer cooperating.
(e) William Morton, Hydraulics Laboratory, Univ. of Washington.

(f) To determine optimum elevation control weir for limiting flood velocities in the improved channel above the weir. A development of venturi throats or contracted sections under the existing railroad bridges, to avoid the expensive alterations of these bridges in the preliminary plans, to estimate the probable maintenance necessary in the improved channel.

(g) The operation of a stuccoed flume model of the movable-bed representing 15,000 ft, the total length of the proposed improvement from Commencement Bay to the northeast corner of the City of Tacoma. The model scales are 1 ft equals 200 ft horizontal, 1 ft equals 20 ft vertical, with provision for changing this distortion ratio from 10 to 1, to 4 to 1.

(h) Model intake and outlet pool complete and movable timber bed set on screw jacks for the full 80 ft length of the model is now completed. The flume framework has been set on the movable bed and is ready for the metal lath and stucco covering.

(i) A six-in. depth of sand mixture will be placed in the bottom of the flume to allow for the movable bed; observation and control equipment is also complete for this project. This same equipment is arranged for interchangeability with various projects of this kind conducted by the laboratory.

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WEST VIRGINIA UNIVERSITY.

Prof. H. W. Speiden, Dept. of Civil Engineering, reports that the hydraulic laboratory is temporarily discontinued.

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UNIVERSITY OF WISCONSIN.

(761) (a) SPEED OF PRESSURE WAVE IN CEMENT-ASBESTOS (TRANSITE) PIPE.
(b) Departmental research project.
(c) Hydraulic investigation on 14 in. Transite pipe line of Chicago & Northwestern Railroad and modulus of elasticity tests in University materials testing laboratory.
(d) L. H. Kessler, M. B. Ganet, G. A. Rohlich and P. S. Davy.
(e) Prof. L. H. Kessler.
(f) To determine the magnitude and rate of advance of the water-hammer pressure-wave front by pressure-time diagrams, by behavior of a calibrated relief valve, and by comparison of magnitude of pressure surges recorded with those computed by formulas used in practice, and to extend information obtained to apply to various sizes of Transite pipe after modulus of elasticity tests are completed.

(g) Pressure-time recording device was located at several stations on the 14-in. pipe line 34,200 ft long between Austin Boulevard Pump Station, Chicago, and the Proviso yard. Relief valve was located at Proviso directly upstream from motor-operated control valve. Two centrifugal booster pumps were on the line. Valve movement, relief valve behavior, advance of the wave front and hydraulic grade line were determined under normal operating conditions.

(h) Paper by L. H. Kessler, Associate Member of Committee on Water Hammer, A.S.M.E. Hydraulic Division, representing the A.W.W.A. was read before the A.S.M.E. Symposium in New York, December 9, 1937, and will appear in A.S.M.E. Transactions. A limited number of blueprinted reports on modulus of elasticity tests, prepared by P.S.Davy, are available.

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(762) (a) RELIEF FROM WATER HAMMER BY MECHANICAL-PNEUMATIC ARRESTERS.
(b) Cooperative Research Project with Industry and W.P.A.
(c) Laboratory project, verified by some field tests.
(d) L. H. Kessler, M. B. Gamet, P. S. Davy.
(e) Prof. L. H. Kessler.
(f) To determine best method of installation, range of application of various sizes of arresters, and effect of repeated stress on life of arresters.
(g) Various sizes of arresters have been tested on pipe diameter ranging from $\frac{1}{2}$ in. to 2 in. inclusive, with lengths from 50 to 400 ft. Instant valve closure has been used throughout the investigation and friction effect is included in all studies.
(h) Experimental investigation is complete.
(i) Paper by L. H. Kessler, "Relief from Water Hammer" in press for A.W.W.A. Journal. Investigators are preparing manuscript for a bulletin to be published soon by the Engineering Experiment Station of the University of Wisconsin.

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(763) (a) MODEL STUDIES OF SPILLWAY OF VESUVIUS DAM.
(b) U.S.Forest Service.
(c) Experimental study of spillway design and action of tumble-bay.
(d) Graham Walton, O. W. Munz, Arno T. Lenz, L. H. Kessler.
(e) Mr. Graham Walton and Prof. Arno T. Lenz.
(f)(g) Model on scale of 1:40 of the spillway and tumble-bay were constructed and tested. The model showed that a modified form of spillway channel, which could be constructed more cheaply , would work as well as the original design. The modified tumble-bay design proved

to be superior in both action and appearance, an important item since the structure is in a park.

(h) Tests completed. Report submitted to Forest Service. Paper summarizing results for publication is in preparation.

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(764) (a) EFFECT OF VISCOSITY AND SURFACE TENSION ON V-NOTCH WEIR COEFFICIENTS.

(b) Departmental research project.

(c) Experimental investigation of flow of oils and water over V-notch weirs.

(d)(e) Prof. Arno T. Lenz.

(f)(g) Discharge coefficients for V-notch weirs with angles from 10 to 90 degrees inclusive were obtained by precise measurements for water and two oils. Temperatures of the liquids were controlled and the corresponding values of viscosity and surface tension determined. These are being correlated by dimensional analysis.

(h) Experimental work completed and analysis in progress.

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(765) (a) MODEL STUDIES OF BIG EAU PLEINE DAM SPILLWAY STRUCTURE.

(b) Consolidated Water Power & Paper Co.

(c) Experimental study of hydraulic jump and water levels in rock channel downstream from structure.

(d) Arno T. Lenz, Kenneth Tuhus, J. Michalos, D. Viereg, G. Krejchik.

(e) Prof. Arno T. Lenz.

(f)(g) Tests of model (scale 1:50) of spillway structure and 350 ft of rock channel downstream from dam. Three types of channel bottom are being tested; the position of hydraulic jump, velocities of flow, and tailwater depths are being noted to determine the most economical amount of excavation and best method of gate operation.

(h) Experimental work about one-third completed.

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(766) (a) MODEL STUDIES OF EROSION BELOW ROTHSCHILD DAM.

(b) Marathon Paper Mills Co., in cooperation with Wisconsin Public Service Commission.

(c) Model studies to find the reason for recession of the river bed below the dam and to determine means of stopping it and of repairing the existing conditions.

(d) Arno T. Lenz, L. H. Kessler, A. Luecker, S. Norris, L. Carlson.

(e) Prof. Arno T. Lenz.

(f) (g) Models at 1:30 scale were constructed of the sluiceway section which has tainter gates at its crest and the timber crib section which has wood gates at its crest. Parts of each section were installed in a test flume and the river bed modeled to scale in sand downstream. Since the tailwater is controlled by a dam downstream from the prototype, the tailwater on the model structure was controlled in the same manner and the gates operated as they are at the prototype. Holes in the river bed were filled and baffles installed on the apron to study behavior of proposed changes.

(h) Report submitted to Marathon Paper Mills Co., and to Public Service Commission. Thesis prepared by Luecker, Morris and Carlson.

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(767) (a) HYDRAULICS OF HEAD SPILLWAYS USED IN EROSION CONTROL WORK.

(b) Departmental research.

(c) To improve methods of erosion control by permanent structures having a spillway section capable of large discharge capacity at low head. It is believed a saving in materials of construction can be made by improving head-discharge characteristics.

(d) L. H. Kessler, Arno T. Lenz, W. Littleton, M. Wendt.

(e) Prof. L. H. Kessler.

(f)(g) Models at 1:20 to 1:10 scale were used of varying width-to-depth ratios and several lengths of pit or spillway section. Tests with and without flood plain are made to estimate the effect of silting after structure is completed. An investigation of the change of pit section in plan is about completed.

(h) Three department theses have been prepared from the data obtained in these studies. It is expected that Bulletin 80 of the Engineering Experiment Station, entitled "Experimental Investigation of the Hydraulics of Drop Inlets and Spillways for Erosion Control Structures", by L. H. Kessler, will be revised in the near future.

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(768) (a) STANDARD WEIR STUDIES.

(b) Departmental research project in cooperation with the Graduate School.

(c) To test accuracy of existing sharp-crested weir formulas and to develop standards of weir design.

(d) A. M. McLeod.

(e) Prof. J. G. Woodburn.

(f)(g) Tests of sharp-crested weir without end contractions in flume 2 ft wide, with heads up to 1 ft; volumetric measurement of flow.

(h) Flume now being designed.
(i) This work is an extension of studies at the State College of Washington on a weir 10 in. high in a flume 1 ft wide with heads up to 0.5 ft, on which a bulletin is now in publication.

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(769) (a) EXPERIMENTAL INVESTIGATION OF LARGE CENTRAL AIR LINE AIR-LIFT PUMPS.
(b) Experimental research.
(c) To study the economy of, and friction losses in, large air-lift pumps in actual service in Wisconsin Municipalities.
(d) L. H. Kessler, F. Wilson, E. Vorel.
(e) Prof. L. H. Kessler.
(f)(g) Calibrated orifices and meters are used together with the usual type of telltale using compressed air. Where possible, percent submergence is varied both by change in volume of air supplied and depth of submergence of the air line.
(h) Four department theses have been prepared, giving results for 6-in., 8-in., 10-in. and 12-in. pumps. Correlation of the results will be made with those presented in Experiment Station Bulletin Vol. IX, No. 4, 1924, entitled "Experimental Study of Air-Lift Pumps and Application of Results to Design" by C. N. Ward and L. H. Kessler. A revised bulletin may be prepared in the near future.

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WORCESTER POLYTECHNIC INSTITUTE. (No report received.)
Alden Hydraulic Laboratory.

(647) Study of electrodes for salt velocity method.

(648) Representative American hydraulic laboratories.

(649) Pitot tube investigations, Study of impact orifice of pitot tubes.

(650) Hartford Model Test, Model test of spillway channel.

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U. S. GOVERNMENT LABORATORIES.

CORPS OF ENGINEERS, LINNTON HYDRAULIC LABORATORY.
(Formerly Bonneville Hydraulic Laboratory.)

(567) (a) MODEL STUDIES OF THE BONNEVILLE PROJECT ON THE COLUMBIA RIVER
(c) A research program to check the hydraulic designs, to furnish data and assist in visualizing the problems connected with design, construction, and future operation of the Bonneville Project.
(e) United States District Engineer, Portland District, Portland, Oregon.

(h) An extensive model study of various proposed tailrace channels for the ultimate installation of ten units at Bonneville has been carried out recently. Much further work on this project is improbable.

(i) A detailed report entitled "MODEL STUDIES OF THE BONNEVILLE TAILRACE FOR TEN UNITS" was issued in Dec., 1937. Information concerning details of the experimental work on the Bonneville Project may be obtained from the Division Engineer, U. S. Engineer Office, North Pacific Division, Portland, Oregon.

(b),(d),(f) and (g). See complete report of this project in Bulletin V-2, pages 66-67.

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(621) (a) COLUMBIA RIVER NEAR THREEMILE RAPIDS.

(c) A research program to check the hydraulic designs, to furnish data and assist in visualizing the problems connected with design, construction, and future operation of the Bonneville Project.

(h) A detailed report was issued in July, 1937; further work in the near future is improbable.

(e) U. S. District Engineer, Second Portland District, Portland, Oregon.

(b),(d),(f) and (g), See complete report of this project in Bulletin V-2, page 68.

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(770) (a) BANK PROTECTION STUDIES.

(b) U. S. Engineer Department, Portland District, Capt. S. L. Damon, District Engineer; R. E. Hickson, Principal Engineer; Claude I. Grimm, Head Engineer, Division Office.

(c) A general research program having a direct practical application to the river maintenance and flood control work of the Corps of Engineers, U. S. Army.

(d) A. J. Gilardi, Resident Engineer in charge of the laboratory.

(e) United States District Engineer, Portland District, Portland, Oregon.

(f) To determine the minimum size of gravel, boulders, or crushed rock which, used as bank protection material, will withstand the action of flowing water under various conditions of velocity, depth, slope of material, and curvature of the channel.

(g) The tests will be made in an open flume provided with observation windows and adequate piezometer connections. The flume is 5 ft deep and 6 ft wide and will include a 30-ft movable bed centered between two 25-ft fixed beds of the same roughness for each size of material tested. The slope of the bed is variable up to 0.5 percent. The shape of the cross section of the flume will also be varied. The available water supply is in excess of 50 cfs. The sizes of material tested will vary from $\frac{1}{4}$ to 8 in.

(h) Gravel is being screened at the present time and actual experiments will be started in January, 1938.
(i) A complete report is contemplated, but the date of such a report cannot be estimated at the present time.

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FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE.

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION.(No report received.)

(716) Watershed management.

(717) Development and rating of flumes for measuring debris-laden streamflow.

(718) Model studies to perfect the design of the "San Dimas" flume for measuring debris-laden flows.

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U. S. GEOLOGICAL SURVEY.

(618) (a) A NEW METHOD OF DETERMINING THE PERMEABILITY, SPECIFIC YIELD AND ELASTICITY OF WATER-BEARING MATERIALS.
(c) General scientific research.
(e) C. V. Theis, 309 Federal Bldg., Albuquerque, New Mexico.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 72.

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(619) (a) A COMPARATIVE INVESTIGATION OF SEVERAL METHODS OF DETERMINING PERMEABILITY OF WATER-BEARING MATERIALS.
(c) General scientific research.
(e) R. M. Leggette,
226 Post Office Bldg., Jamaica, L. I., New York.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 72.

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(697) (a) A STUDY OF INTAKES FOR GAGE WELLS.
(c) Tests of intakes of various forms in different velocities of flowing water; needed for intake design and for hydraulic research.
(e) C. H. Pierce, U. S. Geological Survey, Washington, D. C.
(h) Tests in the 1:8 scale models have been completed. Tests of a few full-size models are now in progress.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 73.

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NATIONAL PARK SERVICE.

(771) (a) PERMEABILITY.
(b) Project conducted for National Park Service.
(c) Study of the effect of moisture films on the permeability of soil; study of the effect on the permeability of percolates having pH of normal, greater than normal and less than normal; study of the effect on permeability of the movement of fines.
(d) Branch of Engineering, National Park Service.
(e) Oliver G. Taylor, Chief Engineer, National Park Service. *
(g) A series of comparative determinations of k using as the percolate, air and also water having varying pH values. Each sample whether used with air or with water to be examined by grain-size analysis the movement of the fine fraction.
(h) Not yet started.

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(772) (a) PERMEABILITY STUDY.
(b) Project conducted for National Park Service.
(c) Comparative study of the effect on permeability of highly permeable materials of admixtures,
(1) Cement
(2) Bentonite
(3) Bitumen.
(d) Branch of Engineering, National Park Service.
(e) Oliver G. Taylor, Chief Engineer, National Park Service. *
(f) To derive data for the construction of blankets on water impounding structures.
(h) Not yet started.

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U. S. BUREAU OF RECLAMATION.

(48) (a) HYDRAULIC MODEL EXPERIMENTS FOR THE DESIGN OF THE BOULDER DAM.
(b)(c)(d)(e)(f)(g)(h) See this bulletin for April 1933. For partial reports see this bulletin for January 1937.
(i) Reports on all phases of the Boulder Canyon project to be published soon.

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(399) (a) MOON LAKE DAM SPILLWAY AND OUTLET WORKS.
(b)(c)(d)(e)(f)(g)(h) See this bulletin for January 1936. For partial reports see this bulletin for January 1937.
(i) Report on outlet works in preparation.

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* E.F.Preece, Asst. Chief Engr., Director of Engineering Laboratory.

(547) (a) HYDRAULIC EXPERIMENTS FOR THE DESIGN OF THE GRAND COULEE DAM.
(b)(c)(d)(e)(f)(g) See this bulletin for October 1933, January 1936, and January 1937.
(h) Tests continued on 1:120 model of ultimate development; 1:120 model of construction stages; 1:40 model of spillway piers and sluiceway models.

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(548) (a) IMPERIAL DAM AND ALL-AMERICAN CANAL TESTS.
(b)(c)(d)(e)(f)(g) See this bulletin for January and July 1935, January 1936, and January and July, 1937.
(h) Tests completed except for further study of pressures on weep holes and stepped aprons of the lateral canal drops. Tests on Drop 5 completed.
(i) Reports will be incorporated in the final report on the Boulder Canyon project.

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(549) (a) CABALLO DAM OUTLET WORKS AND SPILLWAY.
(b)(c)(d)(e)(f)(g) See this bulletin for July 1936 and January 1937.
(h) Report delayed by more urgent work.

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(551) (a) MORMON FLAT SPILLWAY.
(b)(c)(d)(e)(f)(g) See this bulletin for July 1936 and July 1937.
(h) Tests completed. Report incomplete.

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(552) (a) HORSE MESA SPILLWAY.
(b)(c)(d)(e)(f)(g)(h) See this bulletin for July 1936 and January 1937.
(i) Report incomplete.

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(553) (a) ALAMOGORDO SPILLWAY.
(b)(c)(d)(e)(f)(g) See this bulletin for July 1936.
(h) Report delayed.

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(554) (a) BARTLETT DAM SPILLWAY.
(b)(c)(d)(e)(f)(g) See this bulletin for July 1936.
(h) Model reinstalled for additional study due to unforeseen field conditions. Testing completed. Report in preparation.

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(555) (a) ROOSEVELT SPILLWAYS.
(b)(c)(d)(e)(f)(g)(h) See this bulletin for July 1936.
(i) Report delayed.

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(556) (a) STEWART MOUNTAIN SPILLWAY.
(b)(c)(d)(e)(f)(g)(h) See this bulletin for July 1936.
(i) Report incomplete.

(557) (a) CASPER-ALCOVA SPILLWAY AND OUTLET WORKS.
(b)(c)(d)(e)(f)(g) See this bulletin for July 1936 and January 1937.
(h) Tests on needle-valve outlets resumed and completed. Report incomplete.

(558) (a) FRIANT OUTLET WORKS.
(b)(c)(d)(e)(f)(g) See this bulletin for July 1936, January and July 1937.

(559) (a) FRESNO DAM SPILLWAY (Montana).
(b)(c)(d)(e)(f)(g) See this bulletin for July 1936.
(h) Completed. Report in preparation.

(571) (a) GIBSON SPILLWAY.
(b)(c)(d)(e)(f)(g) See this bulletin for January, 1937.
(i) Report delayed.

(699) (a) MARSHALL FORD DAM SPILLWAY.
(b)(c)(d)(e)(f)(g) See this bulletin for July, 1937.
(h) Testing almost completed. Report in preparation.

(700) (a) PARKER DAM.
(b)(c)(d)(e)(f)(g)(h) See this bulletin for July 1937.
(i) Final report delayed.

(701) (a) GRASSY LAKE DAM SPILLWAY.
(b)(c)(d)(e)(f)(g)(h) See this bulletin for July 1937.
(i) Report delayed.

(702) (a) SENTINOE DAM OUTLET WORKS.
(b)(c)(d)(e)(f)(g) See this bulletin for July 1937.
(h) Completed. Report in preparation.

(703) (a) VALLECITO DAM SPILLWAY.
(b)(c)(d)(e)(f)(g) See this bulletin for July 1937.
(h) Testing in progress.

(704) (a) BOCA DAM SPILLWAY.
(b)(c)(d)(e)(f)(g) See this bulletin for July 1957.
(h) Completed. Report in preparation.

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(773) (a) GRASSY LAKE DAM OUTLET.
(b) U.S.Bureau of Reclamation.
(c) Routine laboratory study for design data.
(d) Hydraulic laboratory section, U. S. Bureau of Reclamation.
(e) Chief Engineer, U. S. Bureau of Reclamation, Denver, Colo.
(f) To study stilling-pool design for discharge of needle valves.
(g) Completed. Report in preparation.

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(774) (a) SUN RIVER CANAL HEADWORKS AND CHUTES.
(b) U. S. Bureau of Reclamation.
(c) Routine laboratory study for design data.
(d) Hydraulic laboratory section, U. S. Bureau of Reclamation.
(e) Chief Engineer, U.S.Bureau of Reclamation, Denver, Colo.
(f) For revising designs of structures already in operation.
(g) Model studies for eliminating extremely undesirable flow conditions at outlet works, chutes, and stilling pools.
(h) Testing in progress.

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(775) (a) ROOSEVELT POWER CANAL DIVERSION DAM.
(b) U. S. Bureau of Reclamation.
(c) Routine laboratory study for design data.
(d) Hydraulic laboratory section, U. S. Bureau of Reclamation.
(e) Chief Engineer, U. S. Bureau of Reclamation, Denver, Colo.
(f) For revising design of a stilling pool already in operation.
(g) Model study for eliminating undesirable scour below intake section of canal.
(h) Completed. Report in preparation.

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(776) (a) SEMINOE DAM SPILLWAY.
(b) U. S. Bureau of Reclamation.
(c) Routine laboratory study for design data.
(d) Hydraulic laboratory section, U. S. Bureau of Reclamation.
(e) Chief Engineer, U. S. Bureau of Reclamation, Denver, Colo.
(f) To study hydraulic characteristics of tunnel spillway and river conditions below its outlet.
(g) Model tests.
(h) Completed. Report in preparation.

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(777) (a) ALCOVA DAM OUTLET WORKS.
(b) U.S.Bureau of Reclamation.
(c) Routine laboratory study for design data.
(d) Hydraulic laboratory section, U. S. Bureau of Reclamation.
(e) Chief Engineer, U. S. Bureau of Reclamation, Denver, Colo.
(f) To study the optimum angularity for smooth flow conditions of two needle valves discharging into a tunnel.
(g) Model tests.
(h) Completed. Report in preparation.

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(778) (a) LOS BOCAS DAM SPILLWAY (Puerto Rico).
(b) U. S. Bureau of Reclamation.
(c) Routine laboratory study for design data.
(d) Hydraulic laboratory section, U. S. Bureau of Reclamation.
(e) Chief Engineer, U. S. Bureau of Reclamation, Denver, Colo.
(f) To check pressures on crest; to study effect of piers and performance of stilling pool.
(g) Model test. Study of flow characteristics throughout structure.
(h) Testing in progress.

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(779) (a) ROZA DIVERSION DAM.
(b) U. S. Bureau of Reclamation.
(c) Routine laboratory study for design data.
(d) Hydraulic laboratory section, U. S. Bureau of Reclamation.
(e) Chief Engineer, U. S. Bureau of Reclamation, Denver, Colo.
(f) To check hydraulic design of roller gates, spillway, canal intake and fish ladder.
(g) Model tests. Observation of flow.
(h) Testing to commence soon.

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(780) (a) DEER CREEK DAM SPILLWAY AND OUTLET WORKS.
(b) U.S.Bureau of Reclamation.
(c) Routine laboratory study for design data.
(d) Hydraulic laboratory section, U. S. Bureau of Reclamation, Denver, Colo.
(e) Chief Engineer, U. S. Bureau of Reclamation, Denver, Colo.
(f) To check hydraulic design of spillway and intake chute.
(g) Model study. Observation of flow.
(h) Testing in progress.

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TENNESSEE VALLEY AUTHORITY.

(494) (a) PICKWICK LANDING DAM, SPILLWAY DESIGN.
(c) Investigation of stilling basin and shape of crest for Pickwick Landing Dam.
(e) A.S.Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.
(h) Tests completed.
(i) Report in progress.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 85, or Bulletin V-1, page 65.

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(495) (a) PICKWICK LANDING DAM, COFFERDAMS.
(c) Investigation of effect of cofferdamming and construction operations on river regimen.
(e) A. S. Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.
(h) Tests completed.
(i) Report in progress.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 85, or Bulletin V-1, page 66.

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(573) (a) GUNTERSVILLE LOCK, NAVIGATION STUDIES.
(c) Investigation of navigation conditions at entrance to Guntersville Lock.
(e) A. S. Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.
(h) Tests completed.
(i) Report in progress.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 86, or Bulletin V-1, page 66.

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(574) (a) HIWASSEE DAM, SPILLWAY DESIGN.
(c) Investigation of stilling basin and spillway discharge coefficients.
(e) A. S. Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.
(h) Tests completed.
(i) Report in progress.
(b),(d),(f) and (g). See complete report of this project in Bulletin V-2, page 86, or Bulletin V-1, page 66.

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(575) (a) SWAN LAKE MODEL EXPERIMENT.
(c) Study of effect of closing a small bridge in a long embankment crossing a wide river valley.
(e) A.S.Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.
(h) Tests completed.
(i) Report in progress.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 87, or Bulletin V-1, page 67.

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(577) (a) HEAD INCREASER POWER HOUSE.
(c) Investigation of a combined spillway and power house unit whose object is increasing the effective head on the turbines by utilizing the surplus flood waters to reduce the back pressure on the draft tubes.
(e) A.S.Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.
(h) Tests on a 1:50 scale model of one unit have been made to investigate the effects of: shape of draft tube; shape of flo water spillway; ratio of spillway discharge to turbine discharge; elevation of tailwater; elevation of headwater.

(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 87, or Bulletin V-1, page 67.

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(708) (a) GUNTERSVILLE DAM, SPILLWAY DESIGN.
(c) Investigation of stilling basin and discharge coefficients for Guntersville Dam spillway.
(e) A.S.Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.
(h) Design of a stilling basin was carried out by means of tests on a 1:25 scale model of 3 spillway bays. The design was checked on a 1:110 scale model of the entire spillway. Discharge coefficients are being measured on the 1:25 scale model.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 88.

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(709) (a) CHICKAMAUGA DAM, SPILLWAY DESIGN.
(c) Investigation of stilling basin and discharge coefficients for Chickamauga Dam spillway.
(e) A.S.Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.
(h) Design of a stilling basin was carried out by means of tests on a 1:25 scale model of 3 spillway bays. The design was checked and a gate operating schedule was worked out through tests on a 1:110 scale model of the entire spillway. Discharge coefficients are being measured on the 1:25 scale model.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 88.

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(710) (a) CHICKAMAUGA DAM, COFFERDAM.
(c) Investigation of effect of cofferdamming and construction operations on river regimen.
(e) A.S.Fry, Head Engineer, Tennessee Valley Authority.
(h) Tests completed.
(i) Report under way.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 88.

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(781) (a) LOCK CULVERT SYSTEMS.
(b) Tennessee Valley Authority.
(c) Investigation of various types of culverts for use in filling navigation locks.
(d) Laboratory staff under direction of G.H.Hickox.
(e) A. S. Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.

(f) To develop a simple, cheap, and effective type of culvert for use in filling navigation locks.
(g) Tests will be made on a 1:20 scale model of the lock proposed for the Watts Bar dam. Among various filling schemes will be short culverts through the upper miter sill, short culverts by-passing the upper miter sill, and the use of sector gates. The effectiveness of the various schemes will be measured by the time required for filling, and by the hawser strains necessary to keep barges in position during filling.
(h) Model designed and ready for construction.

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(782) (a) NAVIGATION BELOW PICKWICK LANDING DAM.
(b) Tennessee Valley Authority.
(c) Investigation of proposed dredging program on navigability of shoals below Pickwick Landing Dam.
(d) Laboratory staff under direction of G. H. Hickox.
(e) A.S.Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.
(f) To determine the effectiveness of a proposed dredged channel in facilitating navigation through the shoals below Pickwick Landing Dam.
(g) A model of approximately 11 miles of the Tennessee River below the dam has been constructed to a horizontal scale of 1:300 and a vertical scale of 1:80. The proposed dredging will be reproduced and its effect on navigation determined by observations of currents and by operation of a model barge tow. Tendencies toward silting will be noted.
(h) Model complete. Tests beginning.

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(783) (a) WILSON DAM, SPILLWAY INVESTIGATION.
(b) Tennessee Valley Authority.
(c) Investigation of Spillway Apron to reduce damage from erosion below apron.
(d) Laboratory staff under direction of G. H. Hickox.
(e) A.S.Fry, Head Engineer, Tennessee Valley Authority, Knoxville, Tennessee.
(f) To determine possible corrective measures to reduce erosion below existing apron.
(g) Tests will be made on a 1:50 scale model of several spillway bays in a glass-sided flume so that tendencies toward erosion can be observed.
(h) Model under construction.

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U. S. WATERWAYS EXPERIMENT STATION.

(415) (a) MODEL STUDY OF THE MISSISSIPPI RIVER, HELENA, ARKANSAS. TO THE GULF OF MEXICO.
(c) Model study of flood control plans.
(d) Experiments are conducted at the U. S. Waterways Experiment Station by personnel thereof under the direction of Lieutenant Paul W. Thompson, Director of the Station.
(e) The Director, U. S. Waterways Experiment Station.
(h) Tests have been made of channel enlargement along the Natchez Front. A final report on the results of these tests is in preparation. Tests of the proposed Morganza Floodway are now in progress.
(b) (f) and (g) See complete report of this project in Bulletin V-2, page 93, or Bulletin V-1, page 57.

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(473) (a) MODEL STUDY FOR CHANNEL IMPROVEMENT AT MARACAIBO OUTER BAR, VENEZUELA.
(c) Investigation of progressive westward movement of the outer bar with view to ascertaining any probable future development.
(d) and (e) See (415).
(h) Considerable progress has been made toward verification of the model.
(b), (f) and (g) See complete report of this project in Bulletin V-2, page 94, or Bulletin V-1, page 58.

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(480) (a) MODEL STUDY OF PLANS FOR THE ELIMINATION OF SHOALING IN GALVESTON HARBOR.
(b) The District Engineer, U. S. Engineer Office, Galveston, Texas.
(c) Study of proposed harbor improvements.
(d) and (e) See (415).
(f) The purpose of the study is:
1. To determine the sources of the materials going to make up the shoals in Galveston Channel.
2. To determine the effects of any proposed improvement plan on the Galveston Channel, and corollary to that, to determine the most feasible and economical plan and,
3. To determine the effects of the improvement plans on the other ship channels (Texas City Channel, Houston Ship Channel, and Intracoastal Canal) in lower Galveston Bay.
(g) The model will include the area bounded by the Gulf of Mexico, Hanna's Reef in the East Bay, Redfish Bar in Galveston Bay, and Harurkava Reef in West Bay. The scale of the model is 1:800 for the horizontal and 1:80 for the vertical. Thus the model will cover an area approximately 188 feet by 150 feet. The model will be of fixed-bed construction with the shoal material to be represented by some light-weight material introduced in suspension.

Tides in the model will be accurately represented by four automatic tide gates of the type already in successful operation at this Station. To supplement tidal currents, wave action will be reproduced in the model by five wave machines. Following construction of the model and adjustment to reproduce shoaling in Galveston Channel, the various plans proposed by the Galveston Office will be tested and their relative merits determined.

(h) Design of the model has been completed and construction is under way.

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(535) (a) MODEL STUDY OF THE CHAIN OF ROCKS REACH, MISSISSIPPI RIVER (MILE 203 to MILE 183 ABOVE CAIRO AND THE MISSOURI RIVER FROM MILE 8 TO THE MOUTH).

(c) Study of proposed channel improvements.

(d) and (e) See (415).

(f) To determine the relative effectiveness of four plans for reproducing navigation conditions for the Chain of Rocks reach.

(h) Verification has been completed of the portion of the model which is the subject of the present study. A base test to determine the probable ultimate effects of the existing structures, has been completed. A test of the first of several proposed improvement plans is now being made.

(b) and (g) See complete report of this project in Bulletin V-2, page 95, or Bulletin V-1, page 60.

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(536) (a) MODEL STUDY OF PRYORS ISLAND REACH, OHIO RIVER (MILE 899.0 TO MILE 919.4 BELOW PITTSBURGH, PENNSYLVANIA).

(c) Model study of plans proposed for channel improvement.

(d) and (e) See (415).

(f) The purpose of this study is to determine the location and type of additional works justified in the Pryors Island Reach for further improvement and stabilization of the navigable channel.

(h) Testing of the plans for improving the reach has been completed, and the final report of the study is nearly complete. An additional test is under way to determine the action of the model in reproducing the 1937 flood in the Ohio River.

(b) and (g) See complete report of this project in Bulletin V-2, page 95, or Bulletin V-1, page 60.

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(538) (a) MODEL STUDY OF DOGTOOTH BEND, MISSISSIPPI RIVER (MILE 52.7 TO MILE 4 BELOW CAIRO).

(c) Model study of plans proposed for channel improvement.

(d) and (e) See (415).

(f) To determine method of improving navigation in the Dogtooth Bend Reach of the Mississippi River.

(h) Tests of improvement plans have been completed. A final report containing the results of these tests is being prepared.
(b) and (g) See complete report of this project in Bulletin V-2, page 96, or Bulletin V-1, page 60.

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(539) (a) MODEL STUDY OF SWIFTSURE TOWHEAD, MISSISSIPPI RIVER (MILE 51.2 TO MILE 67.3 ABOVE CAIRO.
(c) Model study of plans for channel improvement.
(d) and (e) See (-15).
(f) To determine the proper location of dikes and dredging to maintain project dimensions of the Mississippi River channel in the vicinity of Swiftsure Towhead.
(h) Verification of the model has been completed. Tests of proposed improvement plans are now being made.
(b) and (g) See complete report of this project in Bulletin V-2, page 96, or Bulletin V-1, page 60.

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(643) (a) MODEL STUDY OF MANCHESTER ISLANDS REACH, OHIO RIVER (MILE 394.6 TO MILE 396.8 BELOW PITTSBURGH, PENNSYLVANIA).
(c) Model study of proposed channel improvement plans.
(d) and (e) See (-15).
(f) The two Manchester Islands referred to above divide the river into three channels, of which only the one on the Kentucky side is navigable. Due to shoaling, the maintenance of the navigation channel has required excessive dredging. The primary purpose of the model studies is to determine the feasibility of procuring a permanent channel by closing the middle channel with a dredged dike in order to increase the velocity of current in the navigable channel. The studies will also include a determination of the f asibility of closing the present navigation channel with a dredged dike at the head of the islands and providing a new navigation channel either between the islands or on the Ohio side.
(h) Model verification is complete. Tests of proposed improvements are under way.
(b) and (g) See complete report of this project in Bulletin V-2, page 98.

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(644) (a) MODEL STUDY OF SPILLWAY FOR SARDIS DAM, NEAR SARDIS, MISS.
(c) Model study of spillway performance.
(d) and (e) See (-15).
(h) Variation of chute walls and approach channel have been tested. Tests on the stilling basin are now in progress.
(b),(f) and (g) See complete report of this project in Bulletin V-2, page 98.

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(784) (a) DEBRIS PRESSURE INVESTIGATION.
(b) California Debris Commission.
(c) Study of excess pressures resulting from impounded debris.
(d) and (e) See (415).
(f) The purpose of this study was the determination of pressures exerted by material impounded by debris dams.
(g) Tests of pressures exerted by saturated impounded debris were conducted in specially constructed apparatus designed for this purpose.
(h) Initial tests are complete and final report is being prepared.

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(785) (a) SOIL TESTS, LOCK AND DAM NO. 2, MISSISSIPPI RIVER.
(b) The District Engineer, U. S. Engineer Office, St. Paul, Minn.
(c) Soils investigation.
(d) and (e) See (415).
(f) The purpose of this study is to classify and determine certain physical properties of the foundation material at the site of the proposed lock. The St. Paul office also desired the opinions and comments that this Station could give from the test results.
(g) Classification of foundation samples, mechanical analyses, Atterberg limits, water control determination, shear tests, consolidation tests, and permeability determinations were made on the samples submitted. Computation of stress distribution in the foundation was made.
(h) Tests of samples are complete.
(i) A preliminary report, Technical Memorandum No. 117-1, has been rendered on the results of such tests.

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(786) (a) DETERMINATION OF THE TOPMOST FLOW-LINE AND MEASUREMENT OF PRESSURE IN THE SUPPLEMENTARY DAM AT THE U.S. WATERWAYS EXPERIMENT STATION.
(b) The Soils Laboratory.
(c) Scientific research.
(d) and (e) See (415).
(f) To study the variation and position of the topmost flow-line in the structure, and to observe the distribution of pressure in the foundation with Goldbeck pressure cells.
(g) Biweekly observations of the wells are made to expand the general fund of knowledge concerning seepage through such structures. Semiannual observations of the Goldbeck pressure cells are made.
(h) As indicated above the observations are being continued.

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(787) (a) SOIL TESTS PERTAINING TO NATIONAL PARK SERVICE DAMS.
(b) National Park Service.
(c) Soils investigation.
(d) and (e) See (415).
(f) The purpose of this investigation was the classification and determination of certain physical properties of the soil proposed for use in construction of the dams.
(g) See (785).
(h) Proposed tests have been made and a final report rendered.
(i) Results of the tests are contained in Technical Memorandum No. 126-1.

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(788) (a) INVESTIGATION TO DETERMINE EFFICACY OF ASPHALT REVETMENT, ASPHALT CUT-OFF WALLS AND BENTONITE FOR CONTROLLING SEEPAGE THROUGH AND UNDER LEVEES.
(b) The Mississippi River Commission.
(c) Scientific research.
(d) and (e) See (415).
(f) To determine the efficacy both of the asphalt mattress method and the bentonite method for reducing seepage through and under levees.
(g) Tests of various methods of using the above materials are being made on large-scale models.
(h) Tests of methods of applying bentonite grout have been made.
(i) A satisfactory method has been evolved.

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(789) (a) REDESIGN OF LEVEE IN CLEAR CREEK DRAINAGE AND LEVEE DISTRICT, UNION COUNTY, ILLINOIS.
(b) The District Engineer, U. S. Engineer Office, St. Louis, Mo.
(c) Soil investigation.
(d) and (e) See (415).
(f) The investigation was limited to determination of the increase in strength of foundation materials beneath Parts II and III of the levee unit and design of the section for the reconstruction of these parts.
(g) Scope of redesign was limited to computation of increased strength of foundation materials.
(h) The design has been completed.
(i) Results of the study are contained in Technical Memorandum 80-2.

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(790) (a) SOIL TESTS AND DESIGN OF LEVEE FLOOD CONTROL PROJECT, ROME, GEORGIA.
(b) The District Engineer, U. S. Engineer Office, Mobile, Alabama.
(c) Soil investigation.
(d) and (e) See (415).
(f) The purpose of this investigation was to determine the kind of material available for construction of the levee unit and to make such tests of these materials as are required for the analysis of the stability of the side slopes of the levee unit. Further, the results of these tests are used to

estimate seepage both as to quantity and effect upon the structure, to check the stability of the side slopes originally planned for this unit, and to submit recommendations regarding changes in these slopes as may appear justified.

(g) A mechanical analysis and water content determination were made on all samples. Composite samples were formed on which were made Atterberg limit tests, plastic and liquid; delayed shear tests; and permeability determinations.

(h) All tests of samples have been made. Analysis of results and application thereof to the design has been made.

(i) The result of this study is contained in Technical Memorandum 128-1.

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(791) (a) MODEL STUDY OF OUTLET WORKS, WAPPAPELLO DAM.
(b) The District Engineer, U. S. Engineer Office, Memphis, Tenn.
(c) Model study of performance of outlet structure.
(d) and (e) See (415).
(f) The general purpose of the model study is to check the hydraulic characteristics of all points in the design of the outlet works, Wappapello dam, and to develop means of correcting any uneconomic, unsafe, or undesirable conditions.
(g) A model will be constructed on a scale of 1:25 for this study. Tests will be made of such features as the approach channel, conservation pool weir, intake structure (including trash racks, curved throat section, gate slots, and vents) transition section, tunnel, stilling basin and exit channel.
(h) Design of the model is complete and construction has been started.

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(792) (a) MODEL STUDY OF SPILLWAY, WAPPAPELLO DAM.
(b) The District Engineer, U. S. Engineer Office, Memphis, Tenn.
(c) Model study of performance of spillway.
(d) and (e) See (415).
(f) The general purpose of the model study is to study conditions resulting from operation of the spillway of the Wappapello dam and to develop means of correcting any unsafe or undesirable conditions found to exist.
(g) The model will be constructed on a scale of 1:100. Observation of velocities downstream from the ogee section of the spillway under various conditions, of actual erosion and of the general spillway characteristics, will be made.
(h) Design of the model is complete and construction has been started.

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(793) (a) MODEL STUDY, FLOOD CONTROL PROJECT, JOHNSTOWN, PENNSYLVANIA.
(b) The District Engineer, U. S. Engineer Office, Pittsburgh, Pa.
(c) Flood control study.
(d) and (e) See (415).
(f) The purpose of this model study will be directed toward determination of the most feasible plans for increasing the channel capacity of the Conemaugh and Little Conemaugh rivers and of Stony Creek, at Johnstown, Pa.
(g) A large-scale model, having a horizontal scale of 1:200 and a vertical scale of 1:80, will be constructed for the study. The model will be constructed so that the effects of bridge piers, curves, changes in section, roughness of walls and bed, etc., are all represented in correct ratio. It is planned to adjust the model to reproduce the hydrography of the floods of 1936-37. Improvement features will then be tested.
(h) Design and construction of the model is under way.

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(794) (a) SOIL MECHANICS RESEARCH CENTER.
(b) The Engineer Department at Large.
(c) Soils research.
(d) and (e) See (415).
(f) The Soil Mechanics Research Center is an Engineer Department institution established at the U. S. Waterways Experiment Station by authority of the Chief of Engineers. The Center exists to disseminate to the Department at large, data and information on soil mechanics and, further, to conduct such studies in the field of soil mechanics as other offices may request.

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(795) (a) HYDRAULIC RESEARCH CENTER.
(b) The Engineer Department at large.
(c) Hydraulic research.
(d) and (e) See (415).
(f) The purpose of the Hydraulic Research Center is to assemble and analyze experimental data of importance to the Engineer Department, and to make these data available to all districts of the department.
(g) The Research Center periodically will issue bulletins, in which experimental works of general interest will be described. It is contemplated, however, that the greatest use of the Center will follow from direct correspondence on specific problems.

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NATIONAL BUREAU OF STANDARDS

(42) (a) INVESTIGATION OF THE PHYSICS OF PLUMBING SYSTEMS.
(c) General research.
(e) The Director, National Bureau of Standards.
(h) The paper giving the results of the study of back-siphonage is being reviewed and will be published shortly in the Journal of Research of the National Bureau of Standards.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 78, or Bulletin V-1, page 68.

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(43) (a) INVESTIGATION OF PIPE BENDS.
(c) General research.
(e) The Director, National Bureau of Standards.
(h) The paper on 4-in. steel 90-degree pipe bends is nearing completion. Apparatus is being set up for tests on 1-in. pipe coils, and tests on 1-in. and 2-in. bends of very long radii.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 78, or Bulletin V-1, page 68.

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(171) (a) INVESTIGATION OF THE PRESSURE VARIATIONS ON THE UPSTREAM AND DOWNSTREAM SIDES OF AN ORIFICE PLATE OR FLOW NOZZLE.
(c) National Bureau of Standards research.
(e) The Director, National Bureau of Standards.
(h) Tests have been completed on 13 nozzles in 4-in. pipe and 2 nozzles in 2-in. steel pipe.
(i) Work on this project is being carried on in conjunction with project (196). Completion of the program is subject to the proviso that sufficient funds are raised by the Committee.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 79, or Bulletin V-1, page 72.

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(258) (a) STUDY OF DIVISORS FOR SOIL EROSION INVESTIGATIONS.
(c) Data for calibration and design.
(e) Chief, Soil Conservation Service.
(h) Since the publication of Bulletin V-2 tests have been made of one divisor of the multislot type. The Geib multislot divisor continues to give the best results. Tests of trash screens have been made to aid in the design of field installations.
(i) In addition to the reporting of the work done thus far, it is planned to design and test divisors of greater capacity than those heretofore studied.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 79, or Bulletin V-1, page 70.

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(341) (a) STUDY OF MEASURING FLUMES.
(c) Data for calibration and design.
(e) Chief, Soil Conservation Service.
(h) A large number of flumes of various shapes and capacities have been built and calibrated. The type H design which has vertical side walls and a slant-back outlet has been used in a series of flumes ranging in capacity from two to thirty cubic feet per second.
(b), (d) (f) and (g) See complete report of this project in Bulletin V-2, page 80, or Bulletin V-1, page 70.

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(342) (a) STUDIES OF ARTIFICIAL CONTROLS FOR STREAM-FLOW MEASUREMENTS.
(c) Cooperative project with the U. S. Geological Survey for comparative performance tests and general scientific research.
(e) The Director, National Bureau of Standards.
(h) The completion of the report had been delayed by the press of other work. Some progress has been made since the last bulletin was issued.
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 80, or Bulletin V-1, page 71.

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(384) (a) TESTS OF SPILLWAY FLASHBOARD TIES.
(c) General research.
(e) The Director, National Bureau of Standards.
(i) A draft of the general paper, summarizing both the laboratory results and the field tests, has been prepared and is being revised..
(b), (d), (f) and (g) See complete report of this project in Bulletin V-2, page 81, or Bulletin V-1, page 71.

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(496) (a) DETERMINATION OF DISCHARGE COEFFICIENTS OF FLOW NOZZLES.
(c) Cooperative research sponsored by A.S.M.E. Special Committee on Fluid Meters, with cooperation of the National Bureau of Standards, University of California, Ohio State University, University of Oklahoma, Cornell University, University of Pennsylvania and the Ingersoll Rand Co.
(e) The Director, National Bureau of Standards.
(h) Test program about 70 per cent completed.
(i) Will require about two years to complete the program and correlate the results; with the further provision that sufficient funds are raised by the Committee.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 81, or Bulletin V-1, page 72.

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(497) (a) METHODS FOR SAMPLING AND ANALYZING SOIL-WATER MIXTURES.
(c) Chief, Soil Conservation Service.
(h) Tests have been made of several sample splitters and of several methods of sampling volumes of mixtures of soil and water. The variables in the sampling tests have been: kind of soil, depth and volume of mixture and concentration. The analysis studies of the submersion, weight-volume and evaporation methods have been continued.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 82, or Bulletin V-1, page 71.

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(563) (a) AGING TESTS ON PIPES.
(c) Cooperative project with the Division of Metallurgy, National Bureau of Standards.
(e) The Director, National Bureau of Standards.
(h) Tests after one year of service were made in August 1937. The next tests will be made in August 1938.
(b),(d),(f) and (g) See complete report of this project in Bulletin IV-2, page 56.

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(564) (a) DENSITY CURRENTS.
(c) General research.
(e) The Director, National Bureau of Standards.
(h) Tests were made in three channels, using both dissociating and non-dissociating salts to form solutions whose specific gravities ranged from 1.02 to 1.20. The criterion of mixing, involving the density of the water, the difference in density of the two liquids, the kinematic viscosity, and the velocity of flow when mixing began to take place, was of the same form and value in all tests.

An analytical study is being made of the various theories and analyses connected with the problem of the stability of superposed fluids of different densities and of the suppression of turbulence through a density gradient, in an effort to correlate these works with the problem at hand.

Various field data obtained through the National Research Council Interdivisional Committee on Density Currents are being analyzed and compared with the laboratory results. To date, field measurements have not been complete enough to allow any direct conclusions to be drawn.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 83, or Bulletin V-1, page 69.

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(616) (a) FLOW IN OPEN CHANNELS.
(c) General research.
(e) The Director, National Bureau of Standards.
(h) A draft of the paper dealing with the open channel experiments of Bazin has been completed and is being reviewed for publication in the Journal of Research of the National Bureau of Standards.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 83, or Bulletin V-1, page 69.

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(705) (a) MODEL STUDIES, SAVAGE RIVER DAM.
(c) Study of performance of side-channel spillway around a proposed earth dam.
(e) The District Engineer, U. S. Engineer Office, Washington, D.C.
(h) Model studies completed. A report, "Model Tests of the Spillway for the Savage River Dam", has been completed and is available for loan.
(i) A short paper on the results of this investigation is being prepared for the Journal of Research of the National Bureau of Standards.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 83.

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(707) (a) DEVELOPMENT OF ARTIFICIAL RAINFALL APPARATUS.
(e) Chief, Soil Conservation Service.
(h) Discharge and intensity distribution tests of a large number of nozzles, including some that were constructed in the laboratory, have been made. Four artificial rainfall outfits have been constructed, two of which have been sent to the field for trial and use.
(i) Further work on this project must include additional studies of the qualities of natural rainfall and the effects of variations of these qualities on the magnitude of the things to be studied with the apparatus.
(b),(d),(f) and (g) See complete report of this project in Bulletin V-2, page 85.

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(796) (a) MODEL STUDIES, WHITE CLAY DAM.
(b) Office of Indian Affairs, U. S. Department of the Interior.
(c) Model tests of the flow over a saddle spillway, and erosion prevention by stilling basin.
(d) C. A. Wright.
(e) The Director, National Bureau of Standards.
(f) To study the head-discharge relation for a low curved spillway crest placed at the end of a long shallow approach channel leading to a steep chute, overflow of side walls and effectiveness of two alternate designs for a stilling basin at the bottom of the chute in preventing erosion downstream.
(g) A 1:60 scale model of the proposed spillway was constructed of cypress and mahogany in a glass-walled flume 30 in. wide. Flare in the approach channel was omitted because of the narrow flume. A graded sand was provided for erosion measurements. Flows, leading up to capacity in seven steps, were set successively for 30 minutes duration, then the depth of erosion was measured by a point gage. The bed was smoothed before each test. Velocity-verticals were measured downstream with a pitot tube.

(h) One design was proved more suitable by the model tests and various improvements were developed. A preliminary report was prepared.
(i) A final report, followed by a paper, is planned.

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(797) (a) PLUMBING MATERIALS AND EQUIPMENT AS RELATED TO LOW-COST HOUSING.
(b) National Bureau of Standards.
(c) Part of a coordinated program of research on low-cost housing.
(d) R. B. Hunter, G. E. Golden, L. O. Olsen, J. Jaffe, F. D. Leonard.
(e) Dr. H. L. Dryden, Coordinator of Program, National Bureau of Standards.
(f) To assemble the data necessary for developing uniform standards and specifications for materials and construction for plumbing installations in low-cost housing construction under Federal control.
(g) A review and study of existing standards as they apply to the field of low-cost housing, will be made, together with an experimental study of plumbing piping layouts (water supply, drain and vent pipes) relative to minimum requirements for the efficient functioning of the system.

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HYDRAULIC RESEARCH IN CANADA.

Ecole Polytechnic de Montreal.

(639) (a) HYDRAULIC MODEL STUDIES OF DIFFERENT SPILLWAY PROFILES.
(c) General scientific research.
(e) Prof. Raymond Boucher.
(h) Experimental work in progress.
(b) (d) (f) and (g) See complete report of this project in Bulletin V-2, page 100, or Bulletin V-1, page 51.

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COMPLETED PROJECTS - ABSTRACTS.

CASE SCHOOL OF APPLIED SCIENCE.

(670) STUDY OF UPPER AND LOWER NAPPE AND DETERMINATION OF COEFFICIENT OF DISCHARGE FOR A SHARP-CRESTED WEIR, CIRCULAR IN PLAN.

The circular weir is 13.70 in. in diameter, comprising a glass cylinder surmounted with a copper crest bevelled to form a sharp crest. The weir is centered in a 6-ft diameter tank, and discharges through a vented stack. Flow is upward through a gravel and sand baffle. Measurements on discharge are by means of a venturi tube, and, for very low flows a calibrated orifice, measurements on head with hook gage. For measurements on the profile of the under nappe, a small brass sphere is mounted on a hoop surrounding the jet, and supported by a vertical rider streamlined in section and attached to the hoop at a point diametrically opposite the pointer on the sphere. The rider extends upward through the overflowing sheet and is carried above by a traversing device with verniers in two planes. Measurements were taken for heads varying from zero to 0.25 diameter, or point at which free fall conditions no longer existed. The trace for the lower nappe was determined for intermediate heads. These traces are not geometrically similar. For high heads, the rise of the nappe is greater than for low heads, but the jet in the shaft is thicker; consequently, the curve of the nappe for high heads crosses the curve of the nappe for low heads. The curves determined are reliable. For heads up to 1/10 diameter, the equation for discharge * is $Q = 2.79LH^{1.412}$. The latter equation is reliable. All measurements were taken by Robert B. DuPont under the direction of Professor George E. Barnes.

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(571) COMPARISON OF HYDRAULIC JUMP FORMED WITH TAILWATER ALONE AND TAILWATER IN COMBINATION WITH BAFFLE PIERS.

The hydraulic jump is formed in a rectangular flume with vertical sides and level floor. The jet 1 ft in width, emerges from under a sluice gate made of 1/8 in. steel plate, and the hydraulic jump is formed by tailwater controlled with a tailgate. The curve is plotted for the ratio $\frac{D_2}{D_1}$ against the ratio $\lambda = \frac{V_1^2}{gD_1}$. This curve agrees with that computed by the formula $D_2 = \frac{-D_1}{2} + \sqrt{\frac{2V_1^2 D_1}{g} + \frac{D_1^2}{4}}$.

A double row of baffle piers of arbitrary dimension and spacing is placed a short distance downstream from the jump, and tailwater adjusted to bring the jump to its original location. A new curve is plotted with the new value of $\frac{D_2}{D_1}$ against λ. With the piers in place, the jump can be held to the

* is $Q = 3.31\ LH^{1.5}$, this is preliminary and subject to verification. For heads from 0.1 to 0.25d the equation

same station with less tailwater. A quantitative index to the action of baffle piers is thereby determined. Piers used in the experiments were rectangular with stepped upstream face, similar to those used in the Muskingum stilling basins. Two sizes of piers were used. The value of λ varied from 9 to 35. Results are accurate for the limited range of conditions studied.

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IOWA INSTITUTE OF HYDRAULIC RESEARCH.

(311) TRANSPORTATION OF BOTTOM LOAD IN OPEN CHANNELS.

Published report of project as announced in Bulletin V-2, page 30 - "The transportation of detritus by flowing water" - by F. T. Mavis, Te-Yun Liu and Edward Soucek, Bulletin II, University of Iowa Studies in Engineering (1937), price $0.35.

Tests of six granular bed materials ranging from 1.4 to 2.4 mm. mean diameter, to determine rates of bed-load movement in terms of bottom velocity and in terms of tractive force. Quantitative comparisons of bottom velocity and tractive force as criteria of the rate of bed movement. Manning's n for model channels with erodible beds. (A limited supply of these bulletins is available for free distribution upon application to the Department of Publications, W-9 East Hall, University of Iowa, Iowa City.)

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(603) DETERMINATION OF SHAPE OF NAPPE AND COEFFICIENT OF DISCHARGE OF A VERTICAL SHARP-CRESTED WEIR CIRCULAR IN PLAN WITH RADIALLY INWARD FLOW.

Tests on three vertical sharp-crested weirs, circular in plan, with radially inward flow were made by C. S. Camp in the spring of 1937. The weirs were made of 10-gage steel plate having a top width of 1/32 inch and a bevel on the downstream side of 60° with the horizontal. Each weir had a chord length of approximately 18 inches, and a height of $3\frac{1}{2}$ feet. Plates having radii of 1, 2 and 3 feet were used and hence subtended central angles of approximately 97°, 44°, and 29°. Radial side walls extended upstream from the weir a distance of three or four times the maximum head used, and continued downstream to the point of convergence. A pyralin wall was used below the weir to permit observation of the nappe from the side. Nappe profiles were located by a sliding hook and point gage mounted on a rigid bar. Discharges were measured gravimetrically. Thirty tests were made with heads varying from 0.046 feet to 0.800 feet.

The position of the nappe when expressed in the dimensionless coordinates x/H and y/H was found to be constant for identical ratios of H/D. The coordinates x and y are horizontal and vertical distances, respectively, in feet from the crest; H is the head on the weir in feet; and D is the diameter of the arc in feet. Table I gives the coordinates of the nappe in terms of these dimensionless ratios.

The coordinates of the high point of the lower nappe were $x/H = 0.40\ H/D + 0.26$ and $y/H = -0.20\ H/D + 0.11$.

The discharge over the three weirs tested can be expressed by the formula $Q = 3.28\ LH^{3/2}$ in which Q is the discharge in cfs, L the length of the crest in feet, and H the head on the crest in feet.

TABLE I.

COORDINATES FOR LOCATION OF NAPPE - ORIGIN AT WEIR CREST

H/D	0.02	0.10	0.15	0.20	0.25
x/H	Values of y/H for Lower Nappe				
0.0	0.000	0.000	0.000	0.000	0.000
0.1	0.080	0.075	0.065	0.061	0.050
0.2	0.100	0.090	0.081	0.067	0.050
0.3	0.090	0.085	0.075	0.055	0.020
0.4	0.070	0.060	0.050	0.021	-0.035
0.6	-0.010	-0.020	-0.050	-0.110	-0.215
0.8	-0.130	-0.140	-0.190	-0.310	-0.570
1.0	-0.285	-0.315	-0.390	-0.620	-1.55
1.2	-0.470	-0.530	-0.635	-1.15	-6.00
1.4	-0.690	-0.790	-0.920	-2.05	
1.7	-1.10	-1.25	-1.50	-6.80	
2.0	-1.53	-1.75	-2.35		
2.5	-2.60	-2.90	-6.00		
3.0	-3.90	-4.65			
3.5	-5.80				
	Values of y/H for Upper Nappe.				
0.0	0.82	0.84	0.86	0.88	0.90
0.1	0.81	0.83	0.85	0.87	0.89
0.2	0.78	0.81	0.83	0.85	0.87
0.3	0.75	0.78	0.81	0.83	0.85
0.4	0.70	0.74	0.77	0.79	0.81
0.6	0.58	0.64	0.67	0.70	0.73
0.8	0.44	0.51	0.55	0.58	0.65
1.0	0.26	0.35	0.39	0.45	0.67
1.2	0.06	0.16	0.22	0.29	0.69
1.4	-0.17	-0.05	0.03	0.15	0.72
1.7	-0.59	-0.42	-0.32	0.30	0.75
2.0	-1.08	-0.87	-0.74	0.25	0.77
2.5	-2.08	-1.75	-1.10	0.40	
3.0	-3.30	-2.82	-0.70		
3.5	-4.77				

Note: Minus Values are below the weir crest.

PROPRIETORS OF THE LOCKS AND CANALS ON MERRIMACK RIVER.
LOWELL, MASS.

An exhibit of the lock system was prepared for the October 1937 meeting of the American Society of Civil Engineers, Hotel Statler, Boston, Mass.

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FOREST SERVICE.

(717) DEVELOPMENT AND RATING OF FLUMES FOR MEASURING DEBRIS-LADEN STREAM FLOW.

The results of this project are published in:
"Measurement of Debris-laden Stream Flow with Critical-depth Flumes", by H. G. Wilm, J. S. Cotton and H. C. Storey.
Proc. Am. Soc. Civil Engrs. Vol. 63, No. 7, September 1937, pp 1259-1275.

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GEOLOGICAL SURVEY.

(562) INVESTIGATION OF CURRENT METER PERFORMANCE IN MEASUREMENTS OF THE VELOCITY OF WATER IN SHALLOW DEPTHS.

Measurements of discharge were made in the 12-foot flume of the National Hydraulic Laboratory primarily for the purpose of determining coefficients to be applied as correction factors to velocities obtained by current meters when used under the adverse conditions of very shallow water. The scope of the investigation covered measurements with standard-size current meters and with cup-type Pygmy current meters having a 2-inch diameter bucket wheel, the depths of water for the purpose of the investigation being limited to a minimum depth of 0.2 foot and a maximum depth of 1.5 feet. The velocities were limited to a range from 0.1 to 1.5 feet per second. Conditions of smooth concrete, 3/4-inch gravel, and coarse gravel bed were investigated. A complete report giving the results of the investigation is being prepared for publication as a Geological Survey water-supply paper.

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BUREAU OF RECLAMATION.

(550) BULL LAKE OUTLET WORKS.

Final report on this project, "Hydraulic Model Experiments for the Design of the Bull Lake Outlet Works", by J. M. Buswell and D. C. Weed, Technical Memorandum No. 556. All inquiries should be addressed to the Chief Engineer, U. S. Bureau of Reclamation, Denver, Colorado.

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(560) NEEDLE VALVE AND RING-FOLLOWER AND CYLINDER-FOLLOWER GATE CHARACTERISTICS.

Correct title of report: "Model Studies of the Mechanics and Hydraulics of Large Control Gates", by N. Noonan and G. H. Hornsby, June 17, 1937. Report on file in the Denver Public Library.

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U. S. WATERWAYS EXPERIMENT STATION.

(540) MODEL STUDY OF GRAND TOWER REACH, MISSISSIPPI RIVER (MILE 84.8 TO MILE 72.4 ABOVE CAIRO).

Results of this model study are contained in Technical Memoranda 114-1 and 114-2.

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(568) MODEL STUDY OF EAST RIVER, NEW YORK.

Results of this model study are contained in Technical Memoranda 125-1 and 125-2.

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(645) MODEL STUDY OF OUTLET STRUCTURES FOR SARDIS DAM.

Results of model tests of various hydraulic features of the outlet structures have been presented in Technical Memoranda 123-1 and 123-2.

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Technical Memoranda and Research Memoranda have been prepared for all completed studies, and for all completed phases of any study now listed as "In progress". Loan copies of these papers may be obtained by writing to the Director, U. S. Waterways Experiment Station, Vicksburg, Miss. (Statement reprinted from Bulletin V-2, page 110)

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NATIONAL BUREAU OF STANDARDS.

(42) INVESTIGATION OF THE PHYSICS OF PLUMBING SYSTEMS.

The paper, "Cross-connections in Plumbing Systems", by R. B. Hunter, G. E. Golden and H. N. Eaton, to be published shortly in the Journal of Research, deals principally with the technical phases of preventing back-flow of water from plumbing fixtures into water-supply systems. It contains a brief history of past work on the subject, an analysis of the limiting values of conditions tending to cause back-flow that may occur in plumbing systems, a classification of cross-connections, an analysis of proposed or suggested means of preventing back-flow, a determination

of minimum requirements for the positive prevention of back-flow under maximum or limiting conditions in the system, and a discussion of the results.

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ECOLE POLYTECHNIQUE DE MONTREAL.

(673) CALIBRATION OF A SHARP-CRESTED TRIANGULAR WEIR.

The report of this project is published in French under the title: "Nouvelles Experiences sur l'Ecoulement en Déversoir triangulaire", by Raymond Boucher, "Revue Trimestrielle Canadienne", (Montréal), September, 1937, No. 91, pp. 253-271.

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VICTORIA UNIVERSITY, MANCHESTER, ENGLAND.

Abstract of Doctor's thesis has been published in:

"Laboratory Investigation of Flume Traction and Transportation", by Y. L. Chang, Proc. Am. Soc. Civil Engineers, Vol. 63, No. 9, November, 1937, pp 1701-1739.

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UNIVERSITY OF LATVIA, RIGA, LATVIA.

Ueber den nächsten Entwicklungsgang der Fluss-Hydraulik und ein zweckmässig Fliess-formel. (The direction of the next development in River Hydraulics and a suitable flow formula), by Prof.Dr.Ing. A. Vītols, Wasserkraft und Wasserwirtschaft, Vol. 32, No.7, April 2, 1937, pp 73-77, and No. 8, pp 91-94.

Abstract - The author points out the inadequacy of present-day hydraulic formulas. For example, the hydraulic radius represents only imperfectly the geometrical form of a stream bed, and this fact must be taken into consideration in the Chezy coefficient. He believes that, if it were possible to free hydraulic coefficients of the influence of these characteristics that are not taken into account in any rational way, it would be possible to bring into the equations pure hydraulic coefficients that would have the nature of universal constants. This would constitute a distinct step forward.

In order to progress in this direction, we must abandon some of the simplifying assumptions of present-day hydraulics, such as that of uniform velocity distribution, and take account of the vertical velocity profile in a stream. By doing this, the author succeeds in developing a new universal Bernoulli equation for open channels which he calls the Bernoulli-Vītols equation.

The author believes that, if river hydraulics is to emerge from the state of lethargy that has characterized it during the past century, it will be necessary to blaze new trails, and this can be accomplished

by the introduction of universal constants in the equations, as has been done in the problem of flow in closed channels.

Finally the author touches on a problem of the morphology of stream beds and utilizes the calculus of variations to its solution. It is hoped that this paper will serve to stimulate further work in this same direction.

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INTERNATIONAL ASSOCIATION FOR HYDRAULIC STRUCTURES RESEARCH.

The Association held its first meeting at Berlin, Germany, October 4-6, 1937. A constitution for the Association was adopted and the following officers were elected: President, Wolmar Fellenius (Sweden); First Vice-President, Rudolf Seifert (Germany); Second Vice-President, E. Meyer-Peter (Switzerland); Secretary, J. Th. Thijsse, Waterloopkundig Laboratorium, Delft, Holland. The following were elected to the Permanent Executive Committee: As Members - G. de Marchi (Italy) and J. G. R. Parmentier (France); As Cooperating Members - L. G. Straub (United States) and I. Egiazaroff (U.S.S.R.). Controllers for 1937 were elected as follows: L. Bonnet, (Belgium) and G. Rodio (Italy).

In September 1937, the Association had 122 individual and 25 corporate members.

Papers were presented and discussed at this meeting according to the following general program - Study of the bed load and suspended load of rivers, including measurement and analysis; Comparison of model experiments on locks, siphons, erosion and river training, with prototype performance for both undistorted and distorted models.

The first copy of an international bulletin on hydraulic research in Europe was issued in July 1937, containing reports of projects from 21 countries, in French, German and English. (No reports are given for the United States or for the U.S.S.R., since these countries distribute their own information.) Copies of the bulletin may be obtained from the Secretary, for 3.75 Hfl. a copy (about $2.00), including postage. It is planned that the bulletin will be issued in the future not oftener than once a year.

Editor's note. All reports, abstracts, and inquiries regarding hydraulic research in all countries other than the United States and the U.S.S.R. should be referred in the future to this bulletin and not to the one issued by the National Bureau of Standards.

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HYDRAULIC RESEARCH COMMITTEES.

Committee on Dynamics of Streams, Section of Hydrology. American Geophysical Union.

Chairman: Dr. Lorenz G. Straub,
University of Minnesota,
Minneapolis, Minnesota.

Members

K. Hilding Beij	W. C. Lowdermilk	C. E. Ramser
H. H. Bennett	Gerard H. Matthes	Wm. W. Rubey
Irving B. Crosby	George W. Musgrave	Fred C. Scobey
John D. Drisko	Martin E. Nelson	Roy N. Towl
H. V. Geib	Morrough P. O'Brien	A. C. Trowbridge
C. S. Howard	R. L. Parshall	Herbert D. Vogel
E. W. Lane	G. W. Pickels	H. H. Wheaton
L. M. Lawson	C. H. Pierce	N. E. Winters.

(No statement furnished for this issue.)

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Special Committee on Floodwaves, Section of Hydrology, American Geophysical Union.

Chairman: Dr. Lorenz G. Straub,
University of Minnesota,
Minneapolis, Minnesota.

Members.

Merrill Bernard	W. G. Hoyt
H. N. Eaton	Hans Kramer
Robert E. Horton	F. T. Mavis
Ivan E. Houk	Morrough P. O'Brien

Harold A. Thomas

The Special Committee on Floodwaves was organized in June of the past year by action of the Executive Committee of the Section of Hydrology of the American Geophysical Union. The Committee has crystallized a program which it is carrying on at the present time with three major objectives:

1. A presentation of the status of the present knowledge of floodwave phenomena.
2. A review of the activities in this country on practical hydrologic problems which involve a knowledge of floodwave hydrodynamics.
3. The crystallization of lines of experimental research needed to fill the gaps in the present knowledge of floodwave phenomena as related to natural and artificial channels.

Several projects for the study of wave phenomena are in progress.

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Transportation Subcommittee of the Petroleum Division of the American Society of Mechanical Engineers.

Chairman: W. G. Heltzel,
Stanolind Pipe Line Company,
Philcade Bldg.,
Tulsa, Oklahoma.

(No statement furnished for this issue.)

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Special Committee on Hydraulic Research, American Society of Civil Engineers.

Chairman: J. C. Stevens,
Spalding Bldg.,
Portland, Oregon.

Members	Cooperating Members.
Clarence E. Bardsley	Donald P. Barnes
Emory W. Lane	Frederic T. Mavis
Lorenz G. Straub	Charles A. Mockmore
Paul W. Thompson	Morrough P. O'Brien
Chilton A. Wright, Secretary.	Harold A. Thomas

The activities of this Committee have been reported in Civil Engineering, Vol. 7, No. 3, March 1937, page 195, and in Bulletin V-2, page 112. The fourth annual report will be published shortly by the American Society of Civil Engineers. During the year, Capt. H. D. Vogel resigned and Lt. Paul W. Thompson was appointed in his place. The Committee met at the University of California, Berkeley, Calif., in August 1937, and has progressed with its program as shown below.

(1) Letter Symbols for use in Hydraulic Laboratories.

A tentative list of symbols was published, Civil Engineering, Vol. 7, No. 1, January 1937, page 84. Action was withheld in order to have this list of symbols consistent with that to be prepared by a new committee on Symbols for Hydraulics, appointed by the American Standards Association. (See note in this bulletin.)

(2) Conformity of Model to Prototype.

Promotion of comparison of behavior of field structures with previous hydraulic-model tests has been continued. Equipment necessary for this purpose has been installed at the Grand Coulee dam, Madden dam, Fort Peck dam, Norris dam and Bonneville dam. A number of pertinent comparisons were made by R. R. Randolph, Jr., in "Hydraulic Tests on the Spillway of the Madden Dam," Proc. Am. Soc. Civil Engrs., Vol. 63, No. 5, May 1937, pages 851-882.

3. Fundamental Research Problems.

Considerable progress has been made on the following research projects, sponsored jointly by grants from The Engineering Foundation and by the institutions concerned:

Traveling Waves in Steep Slopes, by Prof. H. A. Thomas, Carnegie Institute of Technology, Project (490), page 8, this bulletin.

Curves in Open Channels, by Prof. C. A. Mockmore, Oregon State College, Project (681), page 28, this bulletin.

Phenomena of Intersecting Streams, by Prof. M. P. O'Brien, University of California, Project (434), page 5, this bulletin.

Conversion of Kinetic to Potential Energy in Pipe Flow, by Prof. F. T. Mavis, University of Iowa, Project (507), page 19, this bulletin.

Sedimentation at the Confluence of Rivers, by Prof. L. G. Straub, University of Minnesota, Project (677), page 26, this bulletin.

4. Manual of Hydraulic Laboratory Practice.

Drafts of the four sections of the proposed manual - (1) Historical summary, (2) Principles of similitude, (3) Practical applications of the laws of similitude, and (4) Construction and operation of models - are being prepared. It is hoped that the manual will be issued in mimeographed form during 1938.

5. Abstracts of Translations.

Under the sponsorship of the Committee and with cooperation of a group of Freeman scholars and other interested engineers, nine abridged translations for foreign articles in hydraulics were prepared and published in the Proc. Am. Soc. Civil Engrs., Vol. 63, No. 9, November 1937, pages 1-74. (See under "Translations" in this issue.)

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Subcommittee No. 2, Symbols for Hydraulics, Sectional Committee Z-10-b, American Standards Association.

Chairman: J. C. Stevens,
Spalding Bldg.,
Portland, Oregon.

Members.

H.S.Bean	I.E.Houk	J.M.Mousson
A.H.Borchardt	S.L.Kerr	M.P.O'Brien
O.E.Brownell	H.T.Larsen	F.C.Scobey
C.V.Davis	G.H.Matthes	L.G.Straub
H.A.Foster	F.T.Mavis	C.A.Wright

The organization of the Committee was completed in July 1937. A set of general principles for selection of symbols for use in equations has been adopted by the Committee for guidance and the field has been divided into four parts. Subcommittees have been appointed from the committee membership to prepare appropriate lists of symbols for each part as given below:
(1) General Symbols - F. T. Mavis, Chairman
(2) Theoretical Hydraulics - M. P. O'Brien, Chairman
(3) Hydraulic Structures - I.E.Houk, Chairman
(4) Hydraulic Machinery - A. H. Borchardt, Chairman.

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Special Research Committee on Fluid Meters, American Society of Mechanical Engineers.

Chairman: R. J. S. Pigott,
Gulf Research and Development Corp.,
Pittsburgh, Pa.

Members.

H.S.Bean	Louis Gess	Ed S. Smith, Jr.
S.R.Beitler	A.J.Kerr	R.E.Sprenkle
R.K.Blanchard	T.H.Kerr	E.C.M.Stahl
B.O.Buchland	M.P.O'Brien	T.R.Weymouth
W.W.Frymoyer	W.S.Pardoe	M.J.Zucrow

J. R. Carlton, Secretary.

Subcommittees

(1) Flow Nozzle Research, H. S. Bean, Chairman.

The work sponsored by this subcommittee is being carried on at the following institutions:
University of California, Project (280), page 5 this bulletin,
Cornell University, Project (587), page 12 this bulletin,
Ingersoll Rand Co. (not reported in this bulletin)
National Bureau of Standards, Project (17[illegible]), page [illegible] this bulletin,
[illegible] Project (7[illegible]), page [illegible] this bulletin,
Ohio State University, Project (2[illegible]), page [illegible] this bulletin,
University of Oklahoma, Project (617), page 28 this bulletin,
University of Pennsylvania, Project (783), page 29 this bulletin.

(2) Influence of Installation, J. R. Carlton, Chairman.

(3) Description of Meters, R. E. Sprenkle, Chairman.

(4) Revision of Part I, H. S. Bean, Chairman.

Issued 4th Ed. in October 1937, see A.S.M.E. Council Reports for 1937 under Research. (Mechanical Engineering, Vol. 60, No. 1, Jan. 1938, page 16.)

(5) Oil Measurement in Tulsa Area, A. J. Kerr, Chairman.
(6) Joint A.G.A.-A.S.M.E. Committee, T.H.Kerr, Chairman.
(7) Bibliography, J. R. Carlton, Chairman.
(8) Fund Raising, E.C.M.Stahl, Chairman.

The completion of the flow nozzle research will require additional funds.

For previous reports of the work of this committee, see Bulletin V-1, page 99, and Bulletin V-2, page 115.

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Committee for Research on Hydraulic Friction, Division of Engineering and Industrial Research, National Research Council.

Chairman: Th. von Kármán,
Daniel Guggenheim Aeronautical Laboratory,
California Institute of Technology,
Pasadena, California.

(No statement furnished for this bulletin.)

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Water Resources Committee of the National Resources Committee.

Chairman: Prof. Abel Wolman,
Johns Hopkins University,
Baltimore, Maryland.

Members.

H.H.Barrows
H. H. Bennett
I.N.Gabrielson
N.C.Grover
Edward Hyatt
Maj. Gen. E. M. Markham
R. B. McWhorter
J. C. Page
R.E.Tarbett
Thorndike Saville
Sherman Woodward.

Recent activities of the Committee are summarized in Progress Report, Water Resources Committee, August 16, 1937, and Progress Report of the National Resources Committee, Washington, D. C., October 1937.

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National Research Council Interdivisional Committee on Density Currents.

Chairman: Herbert N. Eaton,
National Hydraulic Laboratory,
National Bureau of Standards,
Washington, D. C.

Members.

J. H. Bodine	C. Juday	H.Peters
R.A.Daly	R.T.Knapp	F.P.Shepard
M.M.Ellis	L.M.Lawson	C.S.Scofield
N.C.Grover	W.C.Lowdermilk, or	W.A.Shaw
P.V.Hodges	G.C.Dobson, alternate	H.V.Sverdrup
C.S.Howard	C.R.Oldberg	C.P.Vetter

The efforts of the committee during the last half-year have been directed mainly toward securing data on the conditions in reservoirs that facilitate or retard the occurrence of density currents; that is, currents of water having a density slightly different from that of the surrounding water. The U.S.Bureau of Reclamation, the U.S.Geological Survey, the U.S.Bureau of Fisheries, and the International Boundary Commission have cooperated in a coordinated program of observations at Elephant Butte Reservoir and at Lake Mead. The U.S.Weather Bureau has also cooperated by furnishing prompt information as to storm conditions in the drainage basin of the Rio Puerco.

At Elephant Butte Reservoir, observations have included:

A. Inflow conditions:
1. Volume of flow,
2. Total dissolved solids, daily,
3. Detailed analysis, monthly composite of water.

B. Conditions at cross-sections in reservoir:
1. Water temperature,
2. Specific electric conductance,
3. Density,
4. Dissolved oxygen,
5. Carbon compounds,
6. Light penetration,
7. Biological assay,
8. Determination of various metals and salts.

C. Outflow conditions:
1. Discharge,
2. Temperature of outflow,
3. Water level in reservoir,
4. Temperature of surface water,
5. Conductance of surface water and discharge, weekly,
6. Detailed analysis, monthly composites of surface water and discharge.

The U. S. Bureau of Reclamation has been carrying out a less extensive program of field observations at Lake Mead with the cooperation of the U. S. Geological Survey.

Theoretical and experimental studies of the phenomenon of density currents have been in progress at the National Bureau of Standards. See Project 564 on page 60 of this bulletin.

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Committee on International Bibliography, Section of Hydrology, American Geophysical Union.

Chairman: K. Hilding Beij,
National Bureau of Standards,
Washington, D. C.

Members

Merrill Bernard	C.S.Howard	Thorndike Saville
J.E.Church	W.G.Hoyt	LeRoy K. Sherman
S.T.Harding	C.H.Lee	Lorenz G. Straub
Robert E.Horton	F.E.Matthes	David G. Thompson
		F.J.Veihmeyer

As the American contribution to an international bibliography on hydrology, this committee, with the cooperation of the American Geophysical Union and the National Resources Committee, have issued: "Bibliography of Hydrology in the United States of America for the Years 1935 and 1936". Copies are obtainable from The General Secretary, American Geophysical Union, 5241 Broad Branch Road, Washington, D. C.

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TRANSLATIONS

BUREAU OF RECLAMATION.

The following translations have been prepared at the Bureau of Reclamation since the previous list given in Bulletin V-3, July 1937. Inquiries should be addressed to the Chief Engineer, U. S. Bureau of Reclamation, Denver, Colorado.

Ehrenberger, R. — Wasserbewegung in steilen Rinnen (Schussrinnen) mit besonderer Berücksichtigung der Selbstbelüftung (Flow of water in steep chutes with special reference to self-aeration). Translated by E. F. Wilsey from Österreichischen Ingenieur- und Architektenvereines Nos. 15/16 and 17/18, 1926.

Winkel, R. — Staurohren zur Messung des Druckes und der Geschwindigkeit im fliessenden Wasser (Pitot Tubes for the Measurement of Pressure and Velocity in Flowing Water). Translated by E.F.Wilsey from Zeitschrift des Vereines deutscher Ingenieure, Vol. 67, 1923, p 568.

Ziller, Felix — Beitrag zur Theorie der Bewegung des Wassers in offenen Kanälen und Rohrleitungen (Contribution to the theory of flow in open channels and pipes) Translated by E. F. Wilsey from Wasserkraft und Wasserwirtschaft, Vol. 32, 1937, p. 37.

Pajer, G. — Über den Strömungsvorgang an einer unterströmten scharfkantigen Planschutze (The flow characteristics at an underflow, sharp-edged two-dimensional sluice gate). Translated by E. F. Wilsey from Zeitschrift für angewandte Mathematik und Mechanik, Vol. 17, 1937, p. 259.

.....

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

W. Frössel — "Strömung in glatten, geraden Rohren mit über- und unterschallgeschwindigkeit", (Flow in smooth straight pipe at velocities above and below sound velocity.) Forschung auf dem Gebiete des Ingenieurwesens, Vol. 7, March-April, 1936, pp 75-84. Translated by S. Reiss, and published as Technical Memorandum No. 844, National Advisory Committee for Aeronautics, Washington, D. C., January 1938.

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NATIONAL BUREAU OF STANDARDS.

The following translations have been prepared and are available for loan. Address inquiries to the Director, National Bureau of Standards, Washington, D. C.

R. Eikenroth — (Description of new towing apparatus) translated by M.A.Mason, Freeman Scholar, from Bericht über die Mitgliederversammlung of the Hannoverschen Versuchsanstalt für Grundbau und Wasserbau, E.V., Nov.17, 1934, (Mitteilungen der Hannoverschen Hochschulgemeinschaft, Heft 16).

R. Bourgeat, D. Cahuzac and J.Duellin. — (The rating of water current meters at the Beauvert Laboratory) translated by M.A.Mason, Freeman Scholar, from original paper issued by the Beauvert Laboratory of the Société Hydrotechnique de France, Dec. 31, 1936.

Léon Levin — Nouveau dispositif de dessablement des canaux. (New apparatus for clearing supply channels of sand) translated by M. A. Mason, Freeman Scholar, from Génie Civil, Vol. 111, No. 2, July 10, 1937, pp 39-42.

L. Escande — Détermination pratique du profil optimum d'un barrage déversoir. Tracé des piles par les méthodes aerodynamiques.Application à un ouvrage determiné . (Practical determination of the optimum profile of the face of a spillway dam.Pier shapes determined by aerodynamic methods. Application to a proposed dam.) Translated by M.A.Mason, Freeman Scholar, and C. A. Wright, from Science et Industrie, Vol. 17, No.336, Sept. 1933, pp 430-433, No. 337, Oct., 1933, pp 467-474.

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American Society of Civil Engineers.

Abridged translations of hydraulic papers, Proc. Am. Soc. Civil Engrs., Vol. 63, No. 9, pp. 1-74.

Abridged translations of nine hydraulic papers originally published in foreign languages were prepared by members of the Society's Special Committee on Hydraulic Research, Freeman Scholars, and other engineers.

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FOREIGN PAMPHLETS RECEIVED BY THE NATIONAL BUREAU OF STANDARDS AND IN FILES OF NATIONAL HYDRAULIC LABORATORY.

(Available for loan.)

Argentine Republic.

Hace un Año en Los Estados Unidas
La Ingenieria, Organo oficial del C.A.I, Buenos Aires, No. 756, Oct., 1937. (A year in the United States.)
Rodolfo E. Ballester.
The World Power Conference and description of numerous power projects visited throughout the United States.

Canada.

Twenty-ninth Annual Report of the Hydro-Electric Power Commission of Ontario for the year ended October 31, 1936.

Czechoslovakia.

Model tests with a spillway and sluice gate of an earth dam on the Rožnov. Bečva River, Czechoslovakia.
K. Kostka.
Report of the hydraulic laboratory of the Polytechnic College at Brünn. Reprint from Technicky Obzor, Vol. LXXII, Nos. 1,2, 1937. In Czech with English summary.

Egypt.

Ministry of Public Works, Egypt, Physical Department Paper No. 14, 1924.
Some experiments on the rating of current meters.
P. Phillips.

Ministry of Public Works, Egypt, Physical Department Paper No. 18, 1925.
An experiment to determine correction to sounding in rivergauging.
P. Phillips.

Ministry of Public Works, Egypt, Physical Department Paper No. 21, 1927.
The Lake Plateau Basin of the Nile.
H.E.Hurst.

Ministry of Public Works, Egypt, Physical Department Paper No. 24, 1928.
The measurement of the discharge of the Nile through the sluices of the Aswan Dam. Final conclusions and tables of results.
D.A.F.Watt.

Egypt. (Continued)

Ministry of Public Works, Egypt, Physical Department Paper No. 23, 1927.
The Lake Plateau Basin of the Nile, Second Part.
H.E.Hurst.

Ministry of Public Works, Egypt, Physical Department Paper No. 25, 1930.
Further experiments on the discharge of sluices.
H.E.Hurst.

Ministry of Public Works, Egypt, Physical Department Paper No. 26, 1931.
The Nile Basin. General description of the basin, meteorology, topography of the White Nile basin, Vol. I.
H.E.Hurst, P. Phillips.

Ministry of Public Works, Egypt, Physical Department Paper No. 28, 1932.
The Nile Basin. Measured discharges of the Nile and its tributaries.
Vol. II.
H.E.Hurst, P. Phillips.

Ministry of Public Works, Egypt, Physical Department Paper No. 29, 1933.
The Nile Basin. Ten-day mean and monthly mean gage readings of the Nile and its tributaries.
H.E.Hurst, P. Phillips.

Ministry of Public Works, Egypt, Physical Department Paper No. 32, 1935.
The Nile Basin, Supplement to Volume III. Ten-day mean and monthly mean gage readings of the Nile and its tributaries up to 1932.
H.E.Hurst, P. Phillips.

Ministry of Public Works, Egypt, Physical Department Paper No. 30, 1933.
The Nile Basin, Vol. IV, Ten-day mean and monthly mean discharges of the Nile and its tributaries.
H.E.Hurst, P. Phillips.

Ministry of Public Works, Egypt, Physical Department Paper No. 31, 1933.
The Nile Basin, Supplement to Vol. IV. Ten-day mean and monthly mean discharges of the Nile for the years 1928-1932 and normals for the period 1912-1932.
H.E.Hurst, P. Phillips.

Finland.

Die Gewässerungtersuchungen der Landwirtschafts-
verwaltung in den Jahren 1929-1935.
Kulturtechnische Untersuchungen der Landwirtschafts-
verwaltung in Finnland, Yearbook No. 1, 1936.
Pentti Koitera-
In German.

France.

Note sur le coefficient de débit des déversoirs -
siphons automatiques. (Notes on the discharge coefficients
of automatic siphon spillways.)
V.M.Hegly.
Annales des Ponts et Chaussées, Vol. 107, No. 6, June, 1937,
pp 755-804.

Germany.

Gesellschaft der Förderer der Hannoverschen
Versuchsanstalt für Grundbau und Wasserbau,
Franzius-Institute der Technischen Hochschule.
Report on the third meeting of the members,
November 16, 1935. Published 1937.

Wasserwirtschaft und Talsperrenbauten in den Nil-
ländern.(Water utilization and dam construction in
the Nile Basin.)
Harold Link.
Reprint from Zeitschrift, Verein Deutscher Ingenieure,
Bd. 81, No. 22, May 29, 1937, pp 625-630.

Versuche zur Selbstreinigung von Gewässern.
(Research on self-purifying of flowing water.)
G. Mahr.
Reprint from Vom Wasser XI, 1936, pp. 198-213.

Ueber den nächsten Entwicklungsgang der
Fluss-Hydraulik und eine zweckmässige Fliessformel.
(The next development of river hydraulics, and a
suitable flow formula.)
A. Vitols.
Reprint from Wasserkraft und Wasserwirtschaft,
Vol. 32, Heft 7, April, 1937, pp. 73-77 and 91-94.

Der Staudamm der neuen Bevertalsperre im Wuppergebiet.
(The Water-stop wall of the Bever dam in the
Wupper Region.)
Harold Link.
Reprint from Die Bautechnik, 1937, Heft 23.

Hungary.

Hydraulic Proceedings of the Water Board of the Royal Hungarian Ministry of Agriculture, Vol. XVIII, No. 4, October-December, 1936. In Hungarian with English summary.

1. A. Fáy. The vegetation of alkali lands in Hungary.
2. E. Endrédy. A short summary of the science of soil.
4. J. Várszeghy. Statistical data on the traffic of the Hungarian waterways in 1935.

Das Tiszatal. Hydrographisches Bild und Beschreibung der wasserbaulichen Arbeiten. (The Tisza Valley. Hydrographical picture and description of the hydraulic structures connected with it.
W. Lászlóffy.
Reprint from Hidrologiai Közlöng, Vol. XII, 1932.
In German with English summary.

Abridged statement of the activities of the Hungarian Hydrographic Institute. 1886-1936.
W. Lászlóffy.
In English.

Preface and comments for the volume entitled "Situation Plan, Profile and Cross-Sections of the Tisza River."
W. Lászlóffy.
In English.

Topographic and Hydrographic Map of the Carpathian Basin. Situation Plan, Profile, and Cross-sections of the Tisza River. Royal Hungarian Ministry of Agriculture, Hydrographic Institute.

Hydraulic Proceedings of the Water Board of the Royal Hungarian Ministry of Agriculture, Vol. XIX, No. 1, January-March, 1937. In Hungarian with English summaries.

3. L. G. Kotzmann. Soil problems in Egyptian agriculture.
4. R. Papp. Data of water supply in Hungary.
8. L. Filep. Mass consisting of equal spheres (packing of spheres of the same size.)
9. B. Pataky. Traffic on the Balaton Lake and the Sió River in 1936.

Italy.

Dispositivi per la misura della portata dei canali con minime perdite di quota. (Means for measuring the discharge of a channel with minimum loss of head.)
Part II. F. Contessini. In Italian.
Reprint from L'Energia Elettrica, Fasc. V., Vol. XIII, 1937. Also Part III. G. de Marchi. In Italian.
Reprint from L'Energia Elettrica, Fasc. II, Vol. XIV, 1937.

Italy (Continued.)

La misura delle portate fluide a mezzo dei diaframmi. (The measurement of fluid flow by means of orifices.)
M. Marchetti. In Italian.
Reprint from L'Energia Elettrica, Fasc. I, Vol. XIV, 1937.

Movimento di Correnti a Pelo libero attraverso Strozzature. (Movement of streams with a free surface through constrictions.)
M. Marchetti. (Milan)
Reprint from L'Energia Elettrica, Fasc. XI, Vol. XIII. November 1937. In Italian.

L'Esercizio dei Serbatoi di Regulazione Idrica in Vista di un Servizio Assegnato. (The Use of Reservoirs for Water Regulation from the Point of view of an assigned Service.)
G. Marcello.(Milan.)
Reprint from L'Energia Elettrica, Fasc. VI, Vol. XIII, June 1936; Fasc. I, Vol. XIV, January 1937. In Italian.

Considerazioni Statistiche sulla Portata Massima dei Corsi d'Acqua Naturali (Statistical Considerations on the Maximum Flow of Natural Watercourses.)
M. Palombi.
Tecnica Italiana, December 1936, February, 1937.
In Italian.

Latvia.

Permanent Office of the Hydrological Conference of the Baltic States, Riga, Mitteilung IV, 1936.
"Die Hydrologischen Institutionen der Baltischen Staaten". (The Hydrological Institutions of the Baltic States.)
A description of the purpose and organization of the conference and a list of members. In German.

Norway.

Stream gage records in Norway, 1936. Norges Vassdrags-og Elektrisitetsvesen, Oslo. In Norwegian.

Poland.

Annales de l'Academie des Sciences Techniques, Warsaw, Vol. II, 1935.
Die Geschwindigkeitsformel und ihre Anwendung. (The velocity formula and its application)
M. Matakiewicz. In German.

U.S.S.R.

Scientific Papers of the Leningrad Institute of Engineers of Water Transport, Vol. 6, Transactions of the Scientific Research Section, 1935.

1. B. J. Kalinovitsch. The development of principles of improving rivers for navigation in their natural state. In Russian. p. 38.
2. V.E.Liakhnitsky. Development of the principles of harbor construction. In Russian. p. 56.
3. I.V.Varabolsky. Historical survey of the development of the theory of soil thrust against a wall and of soil resistance to vertical loads. In Russian, p. 66.
4. N.A.Ivanoff. On the development of dredging engineering in the U.S.S.R. In Russian, p. 71.
7. I.F.Konovaloff. Integrating the equation of varied motion for a trapezoidal channel of constant depth and varying breadth. In Russian with English summary, p. 133.
8. N.A.Pantcharin. Equipment and work of Professor Timonoff's laboratory for the years 1932-34. In Russian, p. 148.
10. V.V.Dmitriev. Determination of tractive power for opening miter lock gates. In Russian with English summary. p. 204.

Irrigation Hydrotechnics. Middle Asia Scientific Research Institute of Irrigation, Tashkent Vols. 8, 9, and 10, 1936, Vol. 1, 1936.

Field chemical analyses of water and their evaluation for different purposes.
Middle Asia Scientific Research Institute of Irrigation, Issue 20, Tashkent, 1934. In Russian.

The measurement of irrigation water.
M.A.S.R.I. of I. Issue 22/4, Tashkent, 1934. In Russian.

Irrigation scale for surveyors.
M.A.S.R.I. of I. Issue 24/6, Tashkent, 1934. In Russian.

Reconstruction of irrigation systems of Fergan Dale.
M.A.S.R.I. of I. Issue 25, Tashkent, 1934. In Russian.

U.S.S.R. Commission for Exchange of Hydraulic Laboratory Research Results. Bulletin No. 6 (14). Exchange of Hydrotechnical Research Results. (Work of the laboratories of the Scientific Research Institute of Hydrotechnics in 1935. In English. (Also, the same publication in Russian.)

U.S.S.R. (Continued.)

Gidrotekhnicheskoe stroitel'stvo. (Hydrotechnical construction.)
1935 (Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9)
1936 (Nos. 3, 4, 5, 6, 7, 8-9, 10.)
In Russian.

Data concerning the Construction of the Hydroelectric Power Plants on the Svir' River, U.S.S.R.
Published by Svirstroi Leningrad
1934 (Nos. 1, 2)
1935 (Nos. 3, 4, 5, 6)
1936 (Nos. 7, 8, 9, 10)
In Russian with English summaries.

Journal of the Scientific Research Institute of Hydrotechnics, Leningrad, 1937. Water Power Engineering, Nos. 1, 2, 3, 4-5.
In Russian.

Middle-Asia Scientific Research Institute of Irrigation, Tashkent, No. 30.
"Methods of Construction of Networks of Irrigation Canals", 1935.
K.K.Schubladze and A.S.Tzetkoff. In Russian.

Scientific Research Institute of Water Supply, Tiflis.
"Wells of California", 1935.
B.A.Pischkin. In Russian.

Transactions of the Scientific Research Institute of Water Power, Moscow-Leningrad.
1935, No. 4. In Russian.

Middle-Asia Scientific Research Institute of Irrigation, Tashkent.
Irrigation Hydrotechnics, 1936. (Nos. 1, 2, 3, and 4)
In Russian.

Caucasian Scientific Research Institute of Water Supply, Tiflis.
"Experimental Drainage Work on the Mugan River.
Report of Experiment Station for 1931-32", published 1935.
N.A.Besednowf. In Russian.

Transactions of State Scientific Research Institute of Water Power, Moscow-Leningrad 1935, No. 6.
Technical Analogies of Electrical and Hydromechanical Details of the Automatic Station in the City of Erivan.
B.K.Uralsky. In Russian.

Ukrainian-Russian Academy of Sciences, Work of the Water Resources Institute, Kiev, "Research in Hydraulics", 1936. No. 7. In Ukrainian with German summaries.

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